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## Technical Report Number 84



Social and Economic  
Studies Program

Sponsor:  
Minerals Management  
Service

Alaska Outer  
Continental  
Shelf Region

# NAVARIN BASIN TRANSPORTATION SYSTEMS IMPACTS ANALYSIS

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The United States' Department of the Interior was designated by the Outer Continental Shelf (OCS) Lands Act of 1953 to carry out the majority of the Act's provisions for administering the mineral leasing and development of offshore areas of the United States under federal jurisdiction. Within the Department, the Minerals Management Service (MMS) has the responsibility to meet requirements of the National Environmental Policy Act of 1969 (NEPA) as well as other legislation and regulations dealing with the effects of offshore development. In Alaska, unique cultural differences and climatic conditions create a need for developing additional socioeconomic and environmental information to improve OCS decisionmaking at all governmental levels. In fulfillment of its federal responsibilities and with an awareness of these additional information needs, several investigative programs have been initiated, one of which is the Alaska OCS Social and Economic Studies Program (SESP).

The Alaska OCS Social and Economic Studies Program is a multi-year research effort which attempts to predict and evaluate the effects of Alaska OCS petroleum development upon the physical, social, and economic environments within the state. The overall methodology is divided into three broad research components. The first component identifies an alternative set of assumptions regarding the location, the nature, and the timing of future petroleum events and related activities. In this component, the program takes into account the particular needs of the petroleum industry and projects the human, technological, economic, and environmental offshore and onshore development requirements of the regional petroleum industry.

The second component focuses on data gathering that identifies those quantifiable and qualifiable facts by which OCS-induced changes can be assessed. The critical community and regional components are identified and evaluated. Current endogenous and exogenous sources of change and functional organization among different sectors of community and regional life are analyzed. Susceptible community relationships, values, activities, and processes also are included.

The third research component focuses on an evaluation of the changes that could occur due to the potential oil and gas development. Impact evaluation concentrates on an analysis of the impacts at the statewide, regional, and local level.

In general, program products are sequentially arranged in accordance with MMS's proposed OCS lease sale schedule, so that information is timely to decisionmaking. Reports are available through the National Technical Information Service, and the MMS has a limited number of copies available through the Leasing & Environment Office. Inquiries for information should be directed to: Social and Economic Studies Program Coordinator, Minerals Management Service, Leasing & Environment Office, Alaska OCS Region, P.O. Box 1159, Anchorage, Alaska 99510.

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NAVARIN BASIN (SALE 83)  
TRANSPORTATION SYSTEMS  
IMPACT ANALYSIS

Prepared for  
Minerals Management Service  
Alaska Outer Continental Shelf Region

Prepared by  
Louis Berger and Associates, Inc.

May 1983

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Alaska OCS Social and Economic Studies Program  
Navarin Basin (Sale 83)  
Transportation Systems  
Impact Analysis

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## ABSTRACT

This report evaluates potential air and marine transportation systems impacts in **Unalaska, Cold Bay, St. Paul** and **St. Matthew Island** and parts of the Alaska peninsula following the proposed Navarin Basin OCS **lease sale (#83)**, scheduled for March 1984. A detailed description of existing and anticipated transportation facilities and services is included for **Unalaska/Dutch Harbor, Cold Bay and St. Paul**. There is currently no transportation infrastructure on **St. Matthew Island**. Forecasts of air and marine transportation demands without the economic influence of the lease sale are developed as a base case for comparative analysis. A mean petroleum development scenario prepared by MMS serves as forces of structural change following the lease sale. Forecasts of additional air and marine transportation demands generated by OCS development activities were prepared. Impacts were determined by comparing transportation demands with and without OCS development against existing and anticipated transportation facilities and services.

The Aleutian-Pribilof region surrounding these communities is a relatively isolated area where costs for transportation are high. Freight moves predominantly by water and people travel by air. **Unalaska** is presently the major marine transshipment point for western and northwestern Alaska and the Aleutian region. Cold Bay is presently the major air transfer point in the region. The general condition of transportation facilities in these two communities ranges from fair to excellent with some facilities having special limitations affecting future usage. The quality of transportation services varies depending upon available facilities and demand: but marine and air services are fair. **St. Paul Island**, although poorly served by air and marine transportation modes would not be impacted by the OCS lease sale 83 in the scenario provided by MMS.

Since there are no facilities on **St. Matthew Island**, they will have to be developed as a direct consequence of oil and gas activities resulting from this lease sale. A new **oil terminal** on the southern portion of the Alaska Peninsula is expected to be built as a consequence of oil and gas discoveries in the region.

In the absence of any OCS development, economic activity will be centered around fishing. Bottom fishing **is** expected to show steady growth during the next 15 years. **No** overall improvement **in** quality of services is expected, as operators attempt to keep pace. However, possible introduction of jet aircraft at **Unalaska** could improve **interregional** air travel times. Both **Unalaska** and Cold Bay are expected to maintain their regionally dominant roles **in**, respectively, marine and air transportation. Air facilities and marine facilities at **all** these communities appear to have sufficient capacity to handle expected growth, if existing facility use patterns are maintained, although the present capacities of the petroleum product facilities at the **Unalaska/Dutch** Harbor port would be exceeded after **1995**.

The major transportation related impacts of the Navarin Basin oil and gas development activities are expected to be:

- Development of transportation and other infrastructure at St. Matthew Island.
- Significant increase in marine traffic at **Unalaska/Dutch** Harbor during the construction phase with long delays likely to occur in 1992.
- Increases in air traffic at **Unalaska/Dutch** Harbor which would not require additional infrastructure beyond what is assumed in the Base Case.
- There will be continued pressure to lengthen the airport at **Unalaska/Dutch** Harbor.

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CHAPTER I  
INTRODUCTION

## I. INTRODUCTION

### Purpose

The purpose of this report is to identify and describe the transportation impacts of potential oil and gas development resulting from the proposal Federal outer continental **shelf** (OCS) lease sale number 83. The lease sale area is located between the Aleutian and St. Lawrence Islands of Alaska in an offshore area called the Navarin Basin. This study of transportation impacts is one of several key study elements of a larger integrated effort by the Minerals Management Service (MMS) to evaluate the broad range of possible socioeconomic impacts of the Navarin Basin lease sale. This effort is part of the Alaska OCS Socioeconomic Study Program (**SESP**), which seeks to evaluate **all** federal OCS lease sales planned for Alaska.

This analysis of transportation impacts was prepared for use by MMS decision makers in various steps of the Federal OCS leasing process. The study places emphasis on the information needs of the environmental impact statement (**EIS**) and secretarial issue document (**SID**), which must be prepared for the **Navarin Basin lease sale**. The study also seeks to develop transportation planning information of use to the Intergovernmental Planning Program (**IPP**). Through the **IPP**, the study is expected to aid development of lease-sale stipulations and to provide information to state and local governments on the effects of Federal lease sale on transportation infrastructure and services.

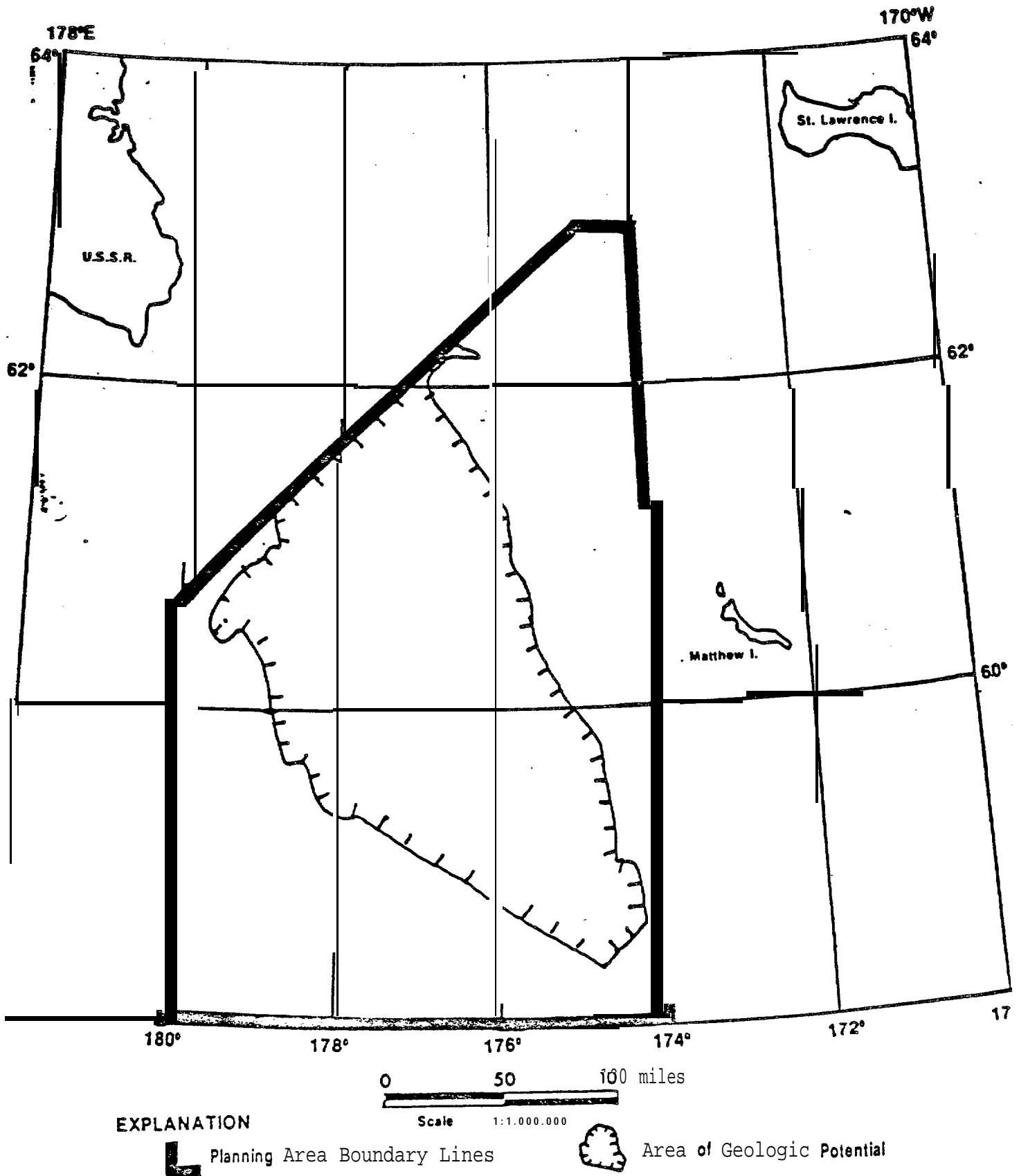
### The Proposed OCS Sale

The proposed Navarin Basin lease sale, OCS sale number 83, currently scheduled to be held in March 1984, is the third proposed OCS lease sale in the Bering Sea. The area initially identified for the sale (the area of call) generally lies between 58°N. latitude and 63°N latitude and is bounded on the west by the U.S./Russia 1867 convention line and on the east by 174° longitude. Its general location is the central Bering Sea (see Figure 1).

# NAVARIN BASIN

FIGURE 1

## OCS SALE 83 CALL FOR NOMINATIONS AND COMMENTS



This map is for information only, and should not be used in place of the standard response map.

Following the "call for nominations" in 1982, **at** which time the oil industry was asked to nominate tracts for inclusion in the **sale**, MMS reviewed the suggested tracts and reduced the **call** area to those sets of tracts (blocks) which are the focus of the EIS and are the assumed location of the offshore OCS activities described in this report.

### Study Scope

In the Aleutian-Pribilof region, as in many regions of Alaska, aviation is the primary mode for moving people, and marine transportation is the primary mode for moving goods. Consequently, the focus of this study is to determine the effects of OCS development on regional air and marine transportation facilities and services.

There are several principal components of this study:

- A description of the present regional aviation and marine transportation systems. This baseline emphasizes facilities, **services**, usage demands, and capacity limitations, but also provides information about relevant regulatory controls, levels of service, service rates, particular regional issues, and the trends of change affecting **facilities**, **services**, and demands.
- A forecast of future aviation and marine transportation demands and service requirements assuming the lease sale is not held. This forecast, called the "Base Case", extrapolates existing trends and conditions. Its purpose is to provide a comparative base for forecasts that of OCS events.
- The transportation element of this forecast builds upon economic and population forecasts prepared by other MMS contractors. The resulting forecasts are evaluated for their effects on air and marine transportation system capacity.

- A forecast of future aviation and marine transportation demands and service requirements assuming the lease sale is held. This forecast assumes **the** "Mean Case" of OCS development as defined in the **SESP** Petroleum Technology Assessment **Report** for the Navarin Basin. This case assumes that there is sufficient oil found during exploration to be commercially feasible to produce. Revised economic and population forecasts, which reflect the addition of OCS events following **the** lease sale, serve as the basis for the transportation forecasts. The increased transportation demand resulting from both direct and indirect employment and related population growth is analyzed and described.
- Specification of impacts for the OCS cases. An evaluation of **the** positive and negative effects of proposed OCS events is made by comparing the OCS development forecasts to the Base Case and to the anticipated capacity of available facilities and services.

There are two important limitations placed on the scope of this study, which effect the broader usefulness of this report. The development of a "transportation plan" to deal with OCS transportation issues was not a purpose of the study, nor was the study to investigate measure to mitigate negative impacts. The **study** is restricted to provide the best available information on these effects to the public. State and local governments, other agencies, or groups and individuals must make independent assessments of alternatives and possible mitigating actions. By making this report available, it is hoped the information will be useful to state and local organizations as they plan for the proposed sale and respond to the Federal government's decisions through the EIS process.

#### organization of Reperk

The report commences in Chapter II with a detailed discussion of the basic methodology used and the key assumptions on which the analysis is built. This is followed in Chapter III with a detailed presentation of the Aleutian-Pribilof region transportation baseline. Chapter IV presents the base case

forecast and an analysis of the impacts of expected economic growth without lease sale 83 on the regional transportation system.

Finally, Chapter V analyzes the expected impacts of OCS development in the Navarin Basin on the air and marine transportation systems. Chapter VI, Conclusions, presents a summary of the major impacts.

Appendix A and B contain detailed traffic and socioeconomic data that would be inappropriate in the body of the report. Appendix C is a Bibliography.

CHAPTER II

STUDY METHODOLOGY

## II. STUDY METHODOLOGY

The general approach to transportation impact analysis is described graphically in Figure 2. This analysis starts with an assessment of existing "baseline" conditions, and leads to an estimate of future "base case" conditions without OCS activity and, finally, to a comparison of the transportation system with and without OCS development.

### Data Sources

For the mean petroleum development scenario? the impacts on the transportation system are expected to be the greatest in the following communities and on **the** marine and aviation transportation systems:

	<u>MARINE</u>	<u>AVIATION</u>
. Anchorage		x
. Unalaska	x	x
. St. Paul/St. George	x	x
. Cold Bay	x	x
. St. Matthew	No infrastructure present	

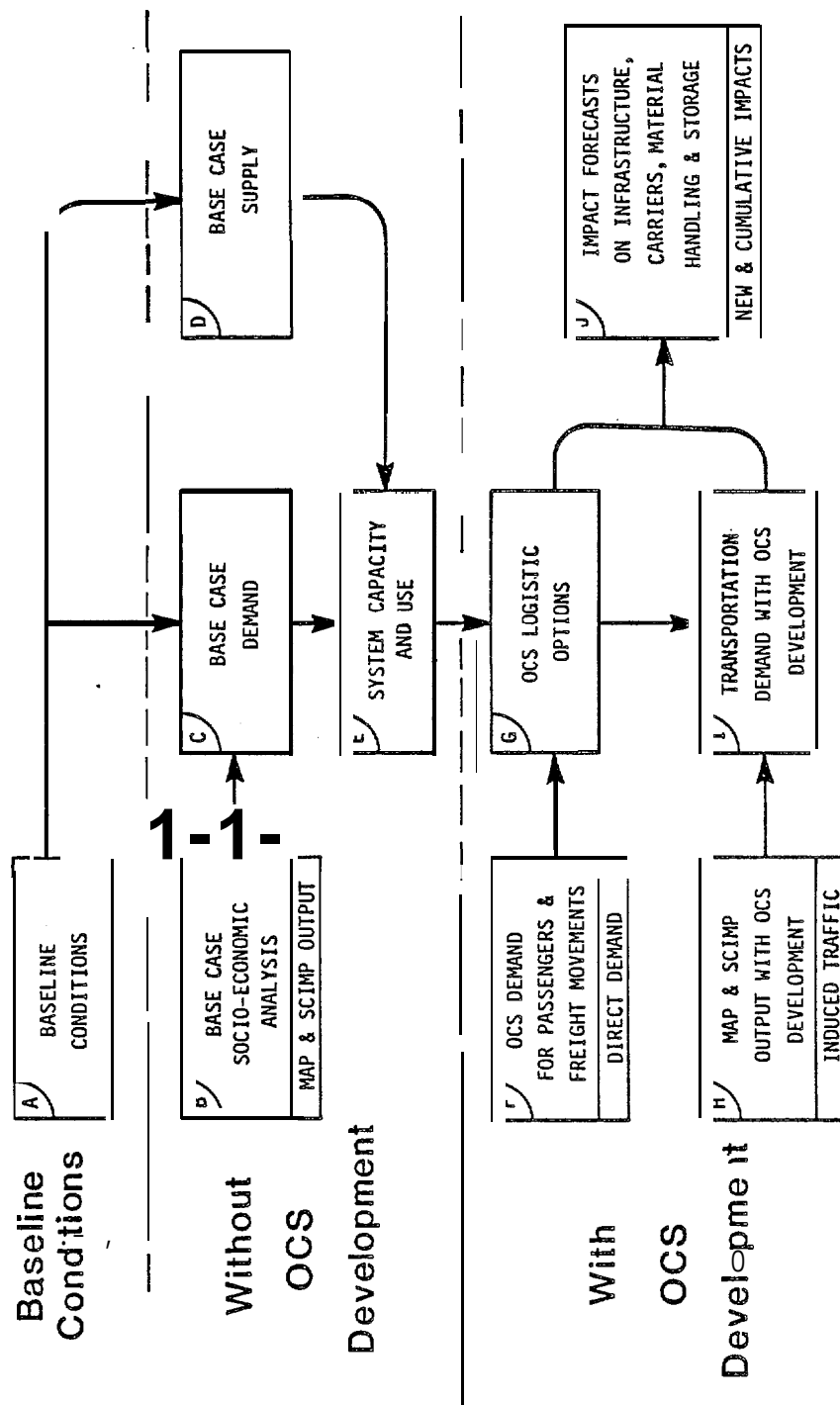
### MARINE SECTOR

#### Traffic

The main source of traffic data is the Corps of Engineers unpublished waterborne commerce data. Earlier Socioeconomic Studies Program (SESP) studies (e.g., Technical Report Number 58) include data through 1978; data for 1979 and 1980 are now available from the Corps. For smaller communities these data were cross-checked with data obtained from the carriers to assure consistency.

FIGURE 2

# FLOW D AGRAM - TRANSPORTATION IMPACT ANALYSIS SUBTASKS



## Infrastructure

For the ports of St. Paul, **Unalaska-Dutch Harbor**, and Cold Bay, Technical Report No. 58 (St. George Basin Petroleum Development Scenarios Transportation Systems Analysis) is quite detailed and includes the data for the existing facilities for 1980 and early 1981. In the case of **Unalaska-Dutch Harbor** indicate these data were updated to include two projects which were under construction in 1982 and should now **be** completed. The new boat harbor and city dock are considered as the baseline condition for this harbor. The draft Aleutian Coastal Ferry and Aleutian and Southwest Alaska Multi Modal Transportation Studies prepared for the State DOT/PF were also addressed.

In the case of Cold Bay, the improved fuel dock has also been included in the baseline. For the docking facilities at St. Paul and St. George Islands, feasibility studies for boat harbors have been prepared by the Corps of Engineers and the Department of Transportation and Public Facilities (DOTPF). The information in these reports has been incorporated where pertinent.

## Carriers

All the principal shipping and tug and barge lines were contacted. The data collected, when available, included:

- route structure, frequency of service, and period of year that the service is offered,
- type of vessel used on the routes,
- tariffs charged for a number of selected communities, and
- tonnages of major cargo types.

## AVIATION SECTOR

### Traffic

Several sources of traffic data were compiled. They include:

- . Earlier OCS studies;
- . Federal Aviation Administration (FAA) Terminal Area Forecasts which contain data on passenger employments and

aircraft operations,

- **City of Unalaska, Aleutian Region Airport, Project Document;** this source includes traffic data on Reeve's operation at **Unalaska** (passenger, freight and air mail) through 1981;
- The airlines and Alaska Transportation **Commission** (ATC); and the
- **State Aviation System Plan** which contains a forecast of traffic at regional airports.

### **Infrastructure**

A detailed inventory of the facilities and navigational problems associated with the **Unalaska** airport are included in the **USKH, 1982, Unalaska Airport Master Plan, 1982-2000** report. The facilities at Cold Bay and St. **Paul** are adequately described in earlier **OCS** reports but were checked against more recent data when available. For the Anchorage International Airport, the **Upper Cook Inlet Airport System Plan** and the State **Aviation System Plan** provided the basic data.

### **Air Carrier Fleet**

Information collected for the **Aviation System Plan** on fleet characteristics and routes covered by different air carriers operating in the region was used for baseline data. Additional information was collected from the air carriers themselves and the ATC.

### **Baseline Conditions**

The impact of OCS development from **lease** sale Number 83 is not likely to occur before 1987/88. **As** such, the physical characteristics and condition of given types of infrastructure at that time are not likely to be the same as they are now. Similarly, the fleet (ships or aircraft) which services the communities affected by this lease sale could be very different from what it is today.

---

The impact of OCS development should be based on a realistic assessment of the future conditions of the infrastructure at each community affected by OCS development. Therefore, the Baseline Conditions used for this study include **all** projects that are funded, and the Base Case includes all projects that have a reasonably high probability of being complete by 1987/88.

Changes in the fleet are likely to occur due to (1) leasing or purchasing new vessels or aircraft, thus reflecting a changing economic environment; (2) obsolescence (due to changes in technology) or accidents, (3) changes in the physical characteristics of the infrastructure, and (4) changes in the regulations. Thus, forecasts of changes in the fleet are more difficult to make with as high a degree of certainty as forecasts of infrastructure.

#### SOCIOECONOMIC ANALYSIS

The Base Case information on socioeconomic conditions without the proposed lease sale is supplied to the Consultant as output of the **SCIMP (Small Community Population Impact)** is an economic and demographic projection model for forecasting at the census division and community level. The economic forecasting methodology employed in this model and in this analysis, assumes that the regional economy is influenced by state and regional events and special programs which alter basic and secondary sector employment and by the level of state expenditures. These basic assumptions are given in Technical Memorandum **NB-3, Methods, standards and assumptions, state and census division economics and demographic Navarin Basin (83) impact analysis** (G. Knapp, 1982). Other reports on bottomfishing (e.g., combs, 1981 and University of Alaska, Sea Grant, 1980, and Peat, Marwick, Mitchell & Company (**PMM**), Sept. 1981) provided key data.

St. Matthew Island is presently uninhabited and was assumed to remain so during the forecast period, 1982 to 2000. This island then might be used as a base for some OCS activities associated with the development of Navarin Basin, although a change in land status would be required.

## TRANSPORTATION DEMAND

This section analyzes the methodology and assumptions which will form the basis of forecasting the transportation demand.

There have been several forecasts of transportation demand for the region: **the** Southwest Alaska Transportation Study (marine sector only), the State-Wide Aviation System **Plan**, previous SESP reports and other studies.

Demand was estimated as the most probable estimate of future freight traffic.

### Marine Demand

**Unalaska.** Unalaska will remain the principal fishing port and fish processing center in the region; consequently most of the marine traffic going to and from this port will be in connection with that industry. **Unalaska also** serves as a transshipment point for fuel shipments going to western and northwestern Alaska. Estimates of this traffic were made in the Western and Arctic Alaska Transportation Study (WAATS) (L. Berger, 1982) which did not include the Bristol Bay area, other Aleutian communities, and the **Pribilof** Islands. Adjustments in these forecasts were made by assuming that the demand for petroleum in these communities is proportional to their population. outbound cargoes related to OCS activities in the **reg ion** used estimates prepared in earlier SESP studies such as Technical Report 58 modified to reflect the latest schedules for the lease sales. Estimates for outbound fish products were drawn from earlier studies (**E.R. Combs**, 1981).

Cold Bay and the **Pribilof** Islands. Marine transportation forecasts prepared for **Cold Bay** and **St. Paul** used the basic methodology and assumptions discussed above. The economic activity at Cold Bay is not likely to change appreciably in **the** forecast period 1982 to 2000. However, the imminent transfer of the **Pribilof** Islands fur-sealing operation from federal to local control requires that an alternative employment base for the inhabitants of these islands be developed. Several possibilities were explored. The Corps of Engineers and **DOTPF** have studied the possibility of developing a fishing port at **St. Paul**, and they

have **also** investigated the feasibility of constructing a port at St. George Island. Both of these feasibility studies give **an** indication of the potential for fisheries development in the area and were used by the Consultant as the basis of preparing a forecast of fisheries development for these islands.

#### Aviation Demand

Briefly, aviation demand consists of passengers, air mail, and air freight. Passenger travel was estimated on the basis of population and employment. The WAATS indicated that per capita income is not an important factor in estimating passenger demand. Air mail is also closely related to population? and air freight is related to population economic **activity**, and construction. The WAATS data and other studies were used to set the Base Case demand.

**Unalaska.** This community serves as a regional hub for the Western Aleutians. Air passenger traffic to this community **is** very seasonal due to the nature of the fishing industry which raises the population to 2300 in 1982 from a permanent population of 1900 at Unalaska. <sup>a</sup> Passenger traffic factors relating employment to trips were developed and related to alternative future employment levels. Air mail estimates was made on the basis of permanent population, and air freight was related to economic activity using medium bottom fish development. In order to estimate the capacity of the infrastructure, air traffic forecasts were converted to aircraft operations (air carrier and air taxi) and peak daily operations.

Lower load factors for aircraft flying to and from **Unalaska** are expected if the runway is lengthened and jet operations are introduced. Jets ~~will~~ also lower the number of aircraft operations because these aircraft have greater capacity than turboprops, e.g., 40 passengers compared to 90 to 120 passengers in Alaskan service.

**Cold Bay.** Cold Bay is used mainly as a transit point for

<sup>a</sup>**Population** figure confirmed with City of **Unalaska** Planning Director, May 1983, and does not necessarily reflect the official U\*S. Census figure.

passengers and freight going to **Unalaska**, **Pribilof** Islands, and other nearby communities. The population of Cold Bay generates a small proportion of the total traffic using the facilities there. The construction of an airport at Unalaska **will** cause a considerable amount of the present traffic using this airport to be diverted to direct flights between **Unalaska** and Anchorage. Besides these considerations, the forecasts of air traffic will follow the basic methodology discussed above.

St. Paul. The introduction of a fishing and fish processing industry to this community **will** cause considerable increase in traffic over what **would** have occurred if these activities were not encouraged. The estimates of traffic **will** be based upon: (1) data given on production and employment (**SCIMP** and Dames and Moore, 1982), (2) on traffic generating coefficients developed for **Unalaska** based on historic data, and (3) **other sources**. With the basic demand functions defined, the forecasts of air traffic will follow the basic methodology discussed above.

## TRANSPORTATION SUPPLY

### Infrastructure

As mentioned previously, projects under construction such as the boat harbor and new city dock in **Unalaska** were considered as existing features of the port. Forecasts of infrastructure development at the three ports (**Unalaska**, **Cold Bay** and **St. Paul**) were developed. Further data were collected on DOTPF programs and plans for the region and linked to the funds likely to be available. Forecasted transportation demand without OCs development was compared with the existing capacity of the facilities. Where this demand appeared to exceed their present capacity in the future, infrastructure were assumed to be built to accommodate the demand. Thus, the thresholds for additional capacity are specified as a range which affects the use of state funds to correct bottlenecks in these facilities, where this can be done with minor investments.

### Material Handling Equipment and Procedures and Storage Facilities

Particular attention was placed on storage facilities since

material handling equipment can be increased relatively easily but expansion of storage capacity requires several years' lead time, provided that there is sufficient land available. Thus, in the short run, the lack of material handling equipment is generally the principal determinant of actual port capacity; however, their relatively low cost and their ease of installation makes it possible to resolve these problems with relative ease. In the case of the marine mode, a ship's equipment can usually overcome a port's lack of material handling equipment at the price of lower cargo handling rates. The problem of handling is not as critical for aircraft, since the cost and size of cargo handling equipment needed to load and unload air freight are less than they are for ships; in addition, cargo handling rates are also lower for aircraft.

### Carriers

The deregulation of the aviation industry allows the entry of new carriers on established routes and the formation of new route structures with relative ease. Also an airline can expand its fleet quickly through leasing or buying aircraft. The aviation fleet service levels have been relatively less stable than marine shipping service, and this instability is likely to increase in the future as a result of further deregulation, high interest rates, and prevailing economic conditions.

Presently **YS-11's** (turboprop) are the most efficient aircraft for the short runway in **Unalaska**, however, if the runway is lengthened to over 1,829 meters (6,000 feet) jet aircraft would then be able to use the airport. This would result in less expensive air transportation and faster travel times; both would improve the quality of service and increase demand. The higher load capacity of the jet aircraft would result in lower load factors than are presently obtained with the **YS-11's** which have load factors of 90 percent or more for extended periods of time.

Marine carriers were assumed to continue gradually upgrading present forms of service.

## SYSTEM CAPACITY AND USE ANALYSIS

## Capacity

As detailed below, the capacity of the transportation infrastructure was determined using generally accepted methods modified to include consideration of the difficult environmental conditions encountered around the Aleutian Islands and in the Bering Sea.

Port Capacity. The methodology for estimating of port capacity is derived from the "NORCAL" method developed for the U.S. Maritime Administration (Manalylics, Inc., February 1976) and adopted for Alaskan conditions in the WAATS. Its principal approach involves identifying activities in a terminal, estimating the capacity of each of the transportation systems and identifying those activities which limit the capacity of the terminal. To describe the capacity of each link in the cargo handling system requires a substantial amount of detailed data. In certain cases, reasonable assumptions were made to estimate based on these data already gathered in WAATS and other studies in Alaska. The generalized NORCAL equation used here is valid for both cargo transfer and storage facilities.

Throughput capacity is defined by the following equation (Louis Berger, 1982):

$$C = \frac{N P_1 P_2 P_3 P_4 t_1 t_2 R x P}{P_o} \quad (1)$$

where: C = throughput capacity in tons, boxes, or units per unit of time

N = total number of berths, gangs, pieces of equipment, or storage area

P<sub>o</sub> = peak demand factor: ratio of peak flow to average flow

P<sub>1</sub> = maximum facility utilization given acceptable delays

P<sub>2</sub> = Fraction of scheduled non-operating time; this variable accounts for labor: hours worked/total hours including breaks; and for equipment: hours operating/total hours including routine maintenance and operator break-time. If routine maintenance is performed and breaks taken when equipment would

otherwise be idle,  $P_2 = 1$ . The variable also accounts for storage, usable area/total area including access and office space.

$p_3$  = Unscheduled delay factor. It considers for labor: weather, equipment unavailability, vessel movement, and longest hatch; and for equipment: breakdowns, labor or auxiliary equipment not available, weather, cargo shifting, vessel movements, and longest hatch.

$p_4$  = Operations allowance. This accounts for any special conditions which reduce capacity, such as congestion on narrow aprons or delays **while** moving landside vehicles into place.

$t_1$  = operating hours/day

$t_2$  = operating days/month (or year)

$R$  = Rated **cycle** time in units per time period. For storage this is the reciprocal of average storage time.

$D$  = Cargo density in tons/units.

Airport Capacity. Airport capacity is defined in the following FAA circulars and handbooks:

- \* Airport Capacity Criteria in Preparing the National Airport Plan - 1968
- \* Airport Capacity Criteria Used in Long Range Planning - 1969
- \* Airport Capacity Handbook, 2nd. ed. - 1969
- \* Techniques for Determining Airport Airside Capacity and Delay - 1976

Because the configuration of the airports is relatively simple, the Airport Capacity Criteria used in long range planning summarized in Airport Engineering by N. Ashford and P. Wright, 1979, are adopted for use in this study.

Storage Capacity. This can be measured in two ways: first, as transit storage, e.g., short-term storage and second as long-term storage. For ports, if storage is used for both transit cargoes (which are either transshipped or consumed locally) and long-term storage, then the capacity can be computed using an average storage time in days and a peaking factor ( $PO$ ) of 1.43 (L. Berger, 1982) with the basic capacity equation. Long-term storage is estimated for cargoes accumulated over the shipping

season and stored for gradual consumption during the rest of the year by determining the static capacity of the warehouse or open storage facility. This can be computed as  $Np_1p_2/p_0$  (see equation 1). The peaking factor is used describe the percentage of cargo which is accumulated by the end of the shipping season. For **airports, only** short-term capacity **will** be estimated.

Threshold Capacity. Significant congestion levels have **built up** in peak periods when capacity levels as estimated above are reached. Depending **on** the individual situation, the threshold capacity **level** could be reached prior to the values resulting from **the** use of equation 1. Threshold capacity is reached when operations of a port or airport become significantly more expensive than usual (i.e., long waiting times are encountered) and under normal conditions the owner of the facility would make an investment aimed at expanding its capacity.

Since capacity, as defined by the above equation, would indicate which **link** in the cargo handling operation has the least capacity (and this is often the material handling equipment or storage facilities capacity) the investments needed to increase capacity in these cases would be modest. However, there will be a point when the capacity of the infrastructure (dock or runway) will also **be** reached, and then the additional capacity **would** have to be made **at** a considerable investment. Thus, a range of port or airport capacities was estimated. The **lower** value indicates that additional but modest investments are needed; the upper end indicate that sizeable investments are required when additional capacity is needed.

#### Demand For Passenger and Freight Movements

The transportation demand for passenger and freight movements is derived from SCIMP model data concerning the size of offshore and onshore developments and related employment levels for the Mean Case scenario. The mean case scenario is defined by MMS as the "most likely" level of resource **finds**.

Traffic demand results from onshore and offshore employment (local and non-local, Alaskan and non-Alaskan) and freight requirements (rig, platform, pipeline and terminal) for each step

of OCS development (exploration, facility development and production). Figures 3 and 4 show the OCS passenger and freight movements. Employment and freight data are obtained from the Petroleum Technology Assessment of Navarin Basin (Dames & Moore, 1982). These data and the OCS Logistics Options (discussed below) define the routing and transportation linkages necessary to bring the employees and freight to and from the service bases that will support OCS activities in the Navarin Basin.

Travel patterns were generated by origin-destination pairs including intermediate or transfer points for each category of employee and each type of freight. Freight movements include drilling material requirements (drill pipe, dry bulk, fuel and drill water), pipeline construction (inbound pipe, coating materials and inbound coated pipe), and consumable demand by non-local OCS population (onshore and offshore). Passenger demand was derived from the employment and uses of various types of aircraft. Direct marine and aviation traffic were added to the Base Case traffic.

#### OCS MARINE DEMAND

All but a small percentage of freight shipped by sea uses a combination of tug and barge and conventional deep sea vessels. Because of the large number of ships presently serving Unalaska, this port will remain the main center of OCS activity during the exploration and oil and gas field development stages.

#### OCS AVIATION DEMAND

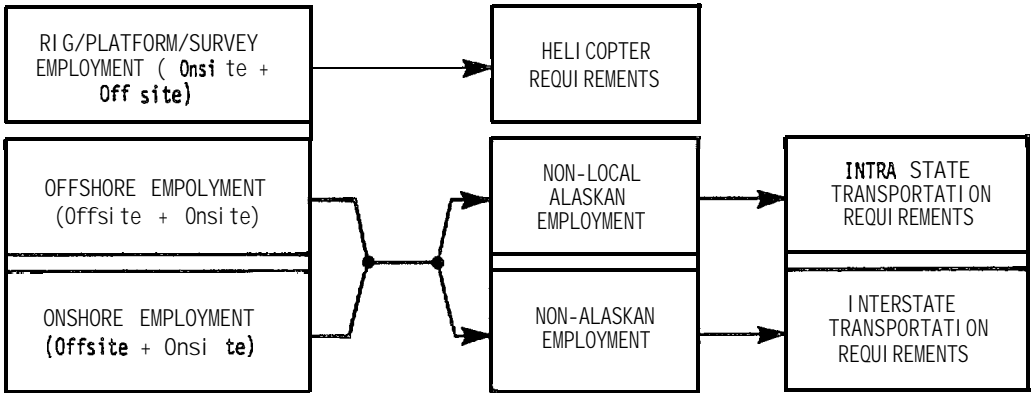
Crew and personnel movements to and from the rigs will be by helicopter. Initially, the centers of these activities are assumed to be Unalaska and Cold Bay. Crew and personnel rotations will follow industry standards and are described in earlier SESP reports. The impact of greater air traffic resulting from the Navarin Basin lease sale will cause an increase in the traffic using Anchorage International Airport.

#### OCS LOGISTICS OPTIONS

Although there might appear to be a large number of possible logistics options, in fact, there are likely to be only a very limited number of viable alternatives. The decision rules

FIGURE 3

**category 1:  
OCS PASSENGER MOVEMENTS**



**Category 2:  
OCS CONSUMABLES**

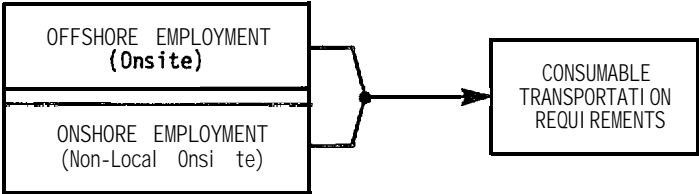
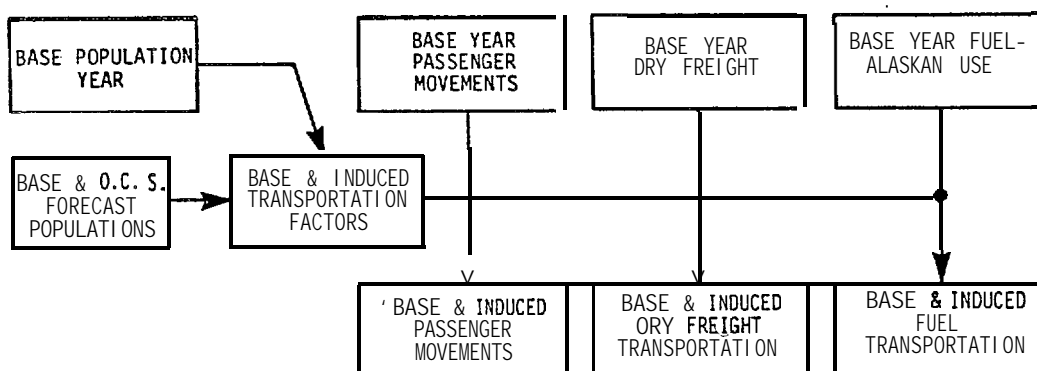
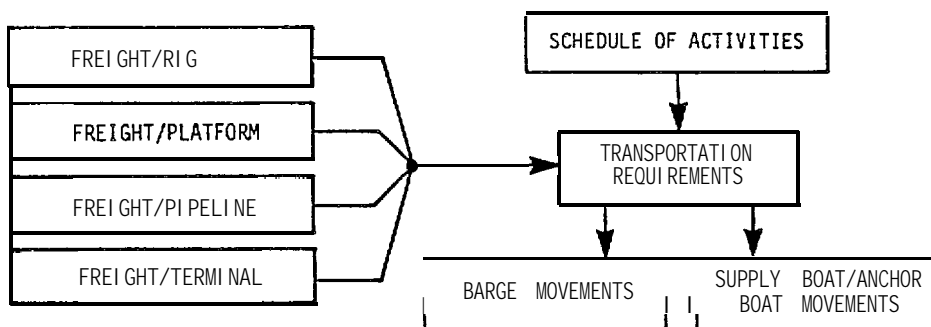


FIGURE 4

**Category 384:  
BASE CASE TRAFFIC  
OCS - INDUCED TRAFFIC**



**Category 5:  
OCS INDUSTRIAL FREIGHT**



concerning these alternatives were based on the analysis of past actions and present intentions of the oil companies and on assumptions which are consistent with earlier **SESP reports**. Since convenience and fast response time rather than costs play a significant part in these decisions, it was assumed that the existing transportation will be used to the maximum extent possible during the exploration stage. Only during the development and production stages would costly modifications to the existing transportation system (in terms of the construction of new infrastructure) be considered practicable. For instance, if St. Matthew Island or Makushin Bay on **Unalaska** Island were to be developed as a marine service base for the Navarin Basin, this is more likely to occur during the development or production phase than during the exploration phase. However, in the case of Makushin Bay, this site might be developed earlier if the oil and gas industry takes an active interest in the exploration and development of several oil and gas fields at the same time.<sup>a</sup>

#### TOTAL TRANSPORTATION DEMAND

The total transportation demand with OCS development is the sum of direct and indirect demand. The indirect demand is caused by additional employment, population and economic activity induced by OCS developments in the area. The indirect transportation demand was estimated using traffic generating factors developed for the Base Case and, where reasonable, these factors were adjusted to reflect the somewhat different characteristics of the indirect transportation demand.

#### OCS Impact Analysis

In the final step of the analysis, OCS development impact on the transportation system was assessed. This impact analysis measures different levels of utilization of the transportation system and compares them with the capacity of the system. Using the threshold approach, bottlenecks in the system were determined.

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<sup>a</sup>This points out the difficulty of looking at one lease sale in isolation. The cumulative effects of several sales in the same area could be quite different than that of a single sale.

Five types of impact forecasts were identified: transportation infrastructure, carriers, passengers, material handling equipment and procedures, and storage. Each was divided into initial impacts resulting from exploration on the transportation system and longer-term impacts caused by the development and production in the mean development scenario.

CHAPTER III  
BASELINE CONDITIONS

### III. BASELINE CONDITIONS

The purpose of this chapter is to describe the present status of transportation facilities and services affecting the **Navarin** Basin Sale 73 Study Area. The following description of baseline conditions and an analysis of trends in transportation demand and supply will serve as the basis for forecasting transportation demands for evaluating potential OCS impacts. Two goals are sought in developing the baseline conditions: 1) to gain an overall perspective of the Aleutian-Pribilof region marine and air transportation **systems**, and 2) to gain a better understanding of that portion of the regional transportation system serving communities likely to be directly affected by OCS events. In this study, three communities are of particular interest: **Unalaska-Dutch Harbor, Cold Bay, and St. Paul**. Some of the data discussed in this chapter will draw on the information in earlier SESP studies, particularly Technical Report Number 58 (PMM, 1981).

The following description of the marine and air transportation systems<sub>f</sub> focuses on infrastructure characteristics traffic, and transport services **available**. Included within these broad categories are:

- Infrastructure characteristics
  - facilities available
  - owner and operator
  - cargo handling rates
  - usage of facilities
  - peak periods
- Traffic
  - inbound cargo
  - outbound cargo
  - transshipped cargo
- Carriers
  - route structure
  - equipment
  - tariffs

### Physical Environment

The reliability of a transportation system and the type of system which evolves over time depends upon the physical environment in which it must operate. Both the air transportation and marine transportation systems in the Aleutian-Pribilof region are constrained by harsh climatic conditions.

The weather in the region is characterized by persistently overcast skies, strong winds, and violent storms. It is often variable and quite local, and clear weather is rare.

In the Aleutians, about 76 to 190 centimeters (30 to 75) inches of precipitation falls annually. Visibility is the poorest in the Aleutians with extensive fogs occurring in the summers. Thick fogs are often accompanied by strong winds prevalent in the vicinity of the Pribilof Islands in the summer, making navigation difficult and dangerous (U.S. Coast Guards Coast Pilot 9, 1981).

The Pribilof Islands are near the southern limits of the ice pack in the Bering Sea. Seven years of National Weather Service ice records at St. Paul Island indicate that there was no sea ice at all in three years. In the four remaining years, ice restricted navigation during March and April; however, in one year, the ice was not thick enough to stop shipping (U.S. Coast Guard, Coast Pilot 9, 1981).

### Marine Transportation System

Marine transportation is the principal mode of freight shipments for both the Aleutian-Pribilof region and for the three communities under study. Aside from small boats and fishing vessels and the Alaska Marine Highway System, this mode is not used for passenger travel. Unalaska-Dutch Harbor is the principal destination for cargo going to the region. Petroleum products and general cargo are shipped into the region principally from California and Seattle. Fish and shellfish products are shipped from Unalaska-Dutch Harbor to Japan and Seattle. A proportion of incoming goods, primarily petroleum products, are transshipped through Dutch Harbor to destinations in northern and western Alaska and, to some extent, the Aleutian Islands and the Alaska Peninsula.

Goods are shipped to and from the region by ocean going tug and barge combinations, general cargo ships, and container ships, while goods transshipped from the region to Northwest Alaska mainly in tug and barge combinations due to the shallow water depths found at most communities located there. Unalaska-Dutch Harbor can receive ocean going vessels directly; at St. Paul, cargo is unloaded and lightered from small tug-barge combinations or coastal ships. At Cold Bay, tugs and barges are generally used. The large quantity of goods shipped to and from Unalaska-Dutch Harbor assures frequent service by several carriers. In contrast, the service to St. Paul and Cold Bay is infrequent. The Alaska Marine Highway System connects the ports of Unalaska-Dutch Harbor and Cold Bay to Kodiak and Homer in the Gulf of Alaska during the summer months.

#### **MARINE INFRASTRUCTURE AND TRAFFIC DATA**

Each marine facility needs to be examined to determine its present role in the overall marine transportation system and its relationship to other facilities at each port. Several features, enumerated below, comprise this examination:

- 1) general description of the facility,
- 2) available commercial facilities and their characteristics,
- 3) water depth and navigational conditions, which limit the size of ships and barges that can use the facilities,
- 4) cargo handling facilities? and
- 5) cargo storage.

Table 1 provides a summary of the marine infrastructure available for the ports of Unalaska-Dutch Harbor, Cold Bay, and St. Paul.

Traffic data include port throughput - inbound and outbound traffic - and its origin and destination (see Appendix A). The movements of freight through the ports are also analyzed.

TABLE 1

MARINE FACILITIES INVENTORY

	<u>UNALASKA</u>	<u>COLD BAY</u>	<u>ST. PAUL</u>
Breakwater	no	no	no
Dock	several	one	one
Berths	yes	yes	no
Floats	no	no	no
Freight Terminal: Dry	yes	no	no
Liquid	yes	yes	no
Freight Storage: Dry	yes	no	no
Liquid	yes	yes	yes
Transshipment Point: Marine	yes	no	no
Air	yes	yes	yes <sup>a</sup>
Passenger Terminal	no	no	no
Boat Repair	yes	no	no
Boat Launch	yes <sup>b</sup>	no	no
Availability of:			
Fueling Facilities	yes	yes	no
Customs	yes	yes	yes

<sup>a</sup>To St. George only.

<sup>b</sup>Under construction.

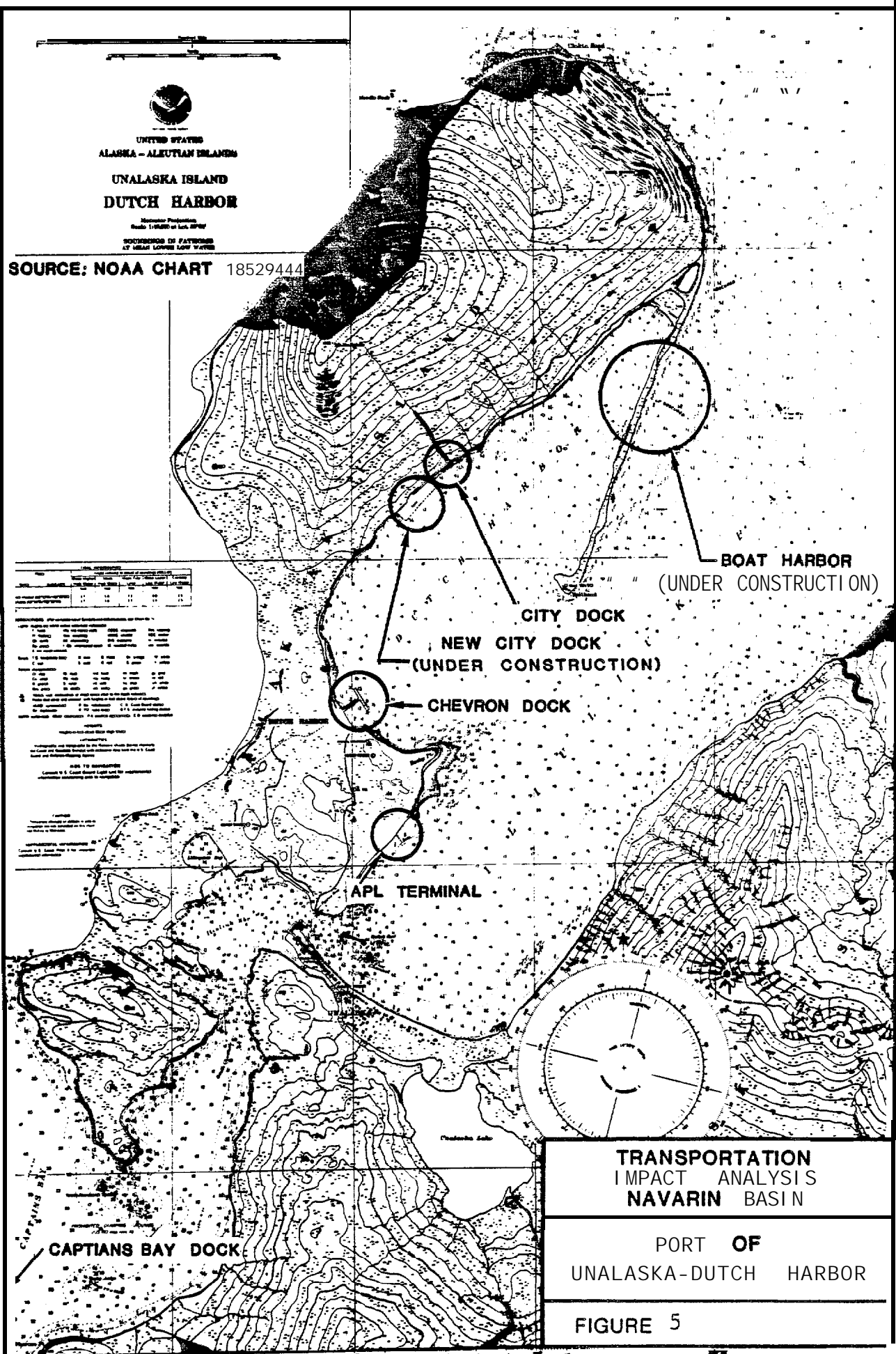
Source: Louis Berger & Associates, Inc.

## Unalaska-Dutch Harbor

Facilities. The City of Unalaska, which includes Dutch Harbor, is located on a portion of Unalaska and on Amaknak Islands; it is approximately 1,280 kilometers (800 air miles) from Anchorage. These two islands were recently (1978) connected by a bridge. Dutch Harbor is a natural harbor which offers protection for the fishing fleets operating in the Bering Sea and around the Aleutian Islands, and it is the only deep water port for commercial vessels in the Aleutian-Bering Sea region. Consequently, Unalaska-Dutch Harbor is a major transshipment port for cargo going to the Aleutian Islands and western Alaska, and it also is a major fish processing port with eight processors. The nature of the traffic is seasonal. A summer peak (July) is associated with the transshipment of goods to northern and western Alaska, and a fall peak (October) is caused by the crab fishery centered in Unalaska-Dutch Harbor. Another period of activity is associated with the transshipment of fish from the Bristol Bay fishery (May and June) to their final destinations in Japan or the Lower 48.

Unalaska-Dutch Harbor is congested during the crab fishing season (October through December) by the large number of fishing vessels. To alleviate this problem, in part, the State of Alaska DOT/PF is building a boat harbor on the Dutch Harbor spit. The facility will consist of one 6 by 61 meter (20 by 200 foot) transient mooring berth connected by a 2 by 15 meter (6 by 50 foot) gangway to a 4 by 84 meter (12 by 275 foot) float, plus 12 other berths. These additional berths will be provided along a 4 by 244 meter (12 by 800 foot) concrete float with six 5-pile dolphins opposite six 1.5 by 19 meter (5 by 62 foot) concrete stall dividers and seven 0.9 by 12 meter (3 by 40 foot) concrete stall dividers. Water and fuel will not be provided at these facilities. The City of Unalaska is also reconstructing an old military dock next to the City Dock as a commercial facility. Both facilities will be completed by the end of 1982. Figure 5 shows the location of the various port facilities in Unalaska-Dutch Harbor.

Besides four commercial port facilities there are numerous docks used by processors to unload the fishing boats and to moor floating processors and several abandoned marine facilities not analyzed in this report.



In the Bay of Dutch Harbor there are two commercial docks: the City Dock on the northwest side of the bay and the Standard Oil (Chevron) Dock. The City Dock is located near the site of an abandoned military dock now being reconstructed by the City. The existing facility is a wood deck on wood piling T-head pier built in 1979 by Sealand and turned over to the City (see Table 2). The new wharf under construction is adjacent to the existing dock and will provide an additional area of 26 by 62 meters (85 by 204 feet). There is only a limited amount of cargo handling equipment associated with the Sealand operation (mainly truck/trailer combination).

The operating parameters of the facility given in Table 2 are based upon discussions with its operator, Sealand, and they can vary considerably from case to case. The values used here are assumed to be present average conditions. The operating parameters are used to evaluate the capacity of the existing facility under existing conditions.

The second dock in Dutch Harbor, operated by Chevron (Standard Oil), serves along with its tank farm as the major resupply base for the Aleutian-Pribilof and the northwestern regions. Its throughput tonnage is about 4 times the storage capacity of its tank farm. This dock is a T-head pier; additional characteristics of this facility are given in Table 3. Since the depth at its face is not sufficient to allow a 35,000 dead weight ton (DWT) tanker to unload its cargo, petroleum products are lightered from the tanker to the dock by barge. It takes approximately three days to unload a tanker. At the Chevron dock, fuel is loaded directly into barges and sold to fishing boats. Up to six fishing boats can be fueled at a time. During the peak of the fishing season (October to November), about 12 to 15 boats can be loaded in an 8 hour work day. There are approximately 72,000,000 liters (19,000,000 gallons) of storage capacity at Chevron's facilities.

Southeast of Dutch Harbor, in Iliuliuk Harbor, American President Lines (APL) has a commercial dock leased from the Ounalashka Native Corporation. The APL facility was commissioned in 1981 and has a concrete deck with steel pilings (see Table 4). There is an on-site storage area of 2.8 hectares (7 acres) which is behind the pier; access to the pier is from either side. There are two buildings on the site: one for

**TABLE 2**

**PORT FACILITY INVENTORY - UNALASKA/DUTCH HARBOR - CITY DOCK**

**Name:** City Dock

**Owner:** City of Unalaska                      **operator:** North Pacific Marine ( Sealand)

**Type:** T-head pier.

**Dimensions:** Pier: 9 by 55 meters (30 X 180 feet)

Jetty: ?

Depth **along** side: 9.1 meters (30 feet)

**Type of** ship using the facility:

1. **Sealand:** Aleutian Developer, a containership with 85-35 ft. containers.
2. **Crowley Maritime** in joint venture with Sealand: Barge

**Year constructed:** 1979                      **Year rehabilitated:** N/A

**Type** of construction: wood decking on wood piles

**Open** storage:

1. Container yard: on-site - 2 acres.
2. Container yard: off-site - 1 1/2 acres.

**Cargo handling equipment:**

1. Ship's equipment only
2. Truck trailer combinations between open-storage area and pier.

**Cargo handling rate:**

1. Unloading: Average - 7 containers/hour
2. Loading: Average - 7 containers/hour

**Table 2-** continued

Operating Parameters:

1. Hours per day(  $t_1$  ): 16 hours normal operating hours when a ship is in: 24 hours during the peak periods
2. Days per month (  $t_2$  ): 30 per month
3. Non-operating hours per day ( $p_2$ ): 2 hours + (coffee breaks (1/4 hour X 6 times) = 1 1/2 hours) = 3 1/2 hours.
4. Non-schedule delays, i.e., weather ( $p_3$ ): 5% of the time
5. operation allowances ( $p_4$ ): Narrow (jetty) causeway allows only one vehicle at a time.
6. peak demand ( $P_o$ ): 4 times average during crab fishery (October - November)
7. Cargo density: Unloaded: Average value is confidential; Maximum = 25MT, outgoing: Average = 15 MT; maximum = 25MT.

Storage (days in **storage** area):

	<u>UNLOADED GOODS</u>	<u>OUT-GOING GOODS</u>
Container	2 days	1 day

Sources: Technical Report No. 58; Louis Berger & Associates, Inc.

TABLE 3

**PORT FACILITY INVENTORY - UNALASKA/DUTCH HARBOR CHEVRON FACILITY**

Name: Chevron

ownership: Unalaska Native Corporation      operator: Chevron

**Type:** T-head pier.

Jetty -

Dimensions: 122 meters (400 feet) from shore

Pier - 102 by 15 meters (334 X 50 feet)

**Depth along side:** 10.4 meters (34 feet) at face

**Type of ship** using the facility: 1. **Incoming:** 35,000 DWT tanker lightered  
2. **Outgoing:** large variety

**Year constructed:** Initial construction prior to 20th Century

**Year of latest rehabilitated:** 1978/79

**Type of construction:** Wood jetty and pier both on wood piles

**Fuel storage:** Capacity: 19,000,000 gallons total

Gasoline: 1,134,000 gallons

Diesel: 9,198,000 gallons

Jetfuel: 7,896,000 gallons

AV Gas: 798,000 gallons

**Cargo handling equipment:** Pumps

**Cargo handling rate:**

unloading: 35,000 DWT tanker lightened in 60 to 72 hours.

Loading: Barge: 94,5000 gallons/hour

Tug: 25,000 gallons/hour per service line

Fishing Boat: 16,000 gallons/hour per service line

Table 3 - Continued

**Operating Parameters:**

1. Hours per day( $t_1$ ): 9 hour/day
2. Days per month ( $t_2$ ): 312 days per year or 26 days per month
3. Non-operating hours per day ( $p_2$ ): little, infrequent
4. Non-schedule delays, i.e., weather ( $p_3$ ): very seldom
5. Operation allowances ( $p_4$ ): none
6. Peak demand ( $p_o$ ): July- resupply: October- fishing boats
7. Cargo density: N/A

**Storage (days in storage area):** N/A

Sources: Technical Report No. 58, Louis Berger & Associates, Inc.

TABLE 4

**PORT FACILITY INVENTORY - UNALASKA/DUTCH HARBOR APL TERMINAL**

Name: APL Terminal

ownership: Dutch Harbor Development Corp.      **Operator:** American President Lines

Type: Wharf

Dimensions: 107 by 46 meters (350 X 150 feet) with mooring buoys at either end of wharf

Depth along side: 12 meters (40 feet) at face

**Type** of ship **using** the facility:

1. APL ship: 204 meters (670 feet) length, C-Master Class
2. variety of other vessels

Year constructed: 1981 (commissioned)      Year rehabilitated: N\A

Type of construction: Concrete deck on piles

open storage:

1. At terminal: 7 acres
2. Off site (1/2 mile): 3 acres

Warehouse (covered storage):

1. Building in need of repair - 18 by 61 meters (60 X 200 ft.)
2. Heated maintenance building - 12 by 61 meters (40 X 200 ft.)

**Cargo handling equipment:**

1. Paceco Gantry Crane, 40 ton capacity
2. 4 spread bars for lifting containers
3. Variety of other spread bars for break bulk shipments

Table 4 - Continued

4. 4 truck trailer combinations
5. fork lifts: 1-25 ton, 1-10 ton, 3-4 ton

Cargo **handling** rate: (tons/hour or containers/hour)

Rated or maximum: Container- Gantry crane: 30 containers/hour

Break bulk- Gantry crane: 300 tons/hour

Average: Container- 15-25 containers/ hour

Break bulk- 15-20 tons/hour, i.e., 20 picks per hour

Operating **Parameters**:

1. Hours per day( $t_1$ ): Variable 0-24 hours, when in operation normally 8 to 10 hours
2. Days per month ( $t_2$ ): not operated 2 days per week because of demand not capacity
3. Non-operating hours per day ( $p_2$ ): N/A
4. Non-schedule delays, i.e., weather ( $p_3$ ): Gantry Crane doesn't work in winds greater than 40 knots (4-5 days year)
5. Operation allowances ( $p_4$ ): none
6. Peak demand ( $p_0$ ): July associated with Bristol Bay fisheries peak 1.5 - 2.0 average.
7. Cargo density (tons/container): 18 metric tons  
(tons/break bulk): 2-5 metric tons per lift

**Storage(days in storage area):** N/A

	<u>UNLOADED GOODS</u>	<u>OUT-GOING GOODS</u>
Container:	10 - 14 days	10 - 14 days
Break:	- do -	- do -

Sources: Technical Report No. 58; Louis Berger & Associates, Inc.

storage and the other for maintenance activities. In contrast to the **Sealand** operation which depends upon ship's equipment, the APL facility has a variety of cargo handling equipment, including a gantry crane. Consequently, the APL facility has a much higher loading/unloading rate than the City Dock used by Sealand.

To the southwest at Captains Bay **Crowley** Maritime operates a dock facility called Captains Bay Tank Farm or Captains Bay Dock. This facility is operated for the transshipment of goods associated with the "cool barge" operation in Western Alaska i.e., the resupply of federal facilities in the Aleutian Islands and Western Alaska. It is not generally available for commercial operations. A portion of the cargo is off-loaded from large ocean-going barges and transferred to smaller draft barges better able to unload goods at the government installations located in Western Alaska. Because the resupply activities are done only during the summer months, this facility usually operates between 15 May and 15 October. However, these facilities could be used on a year round basis if demand warranted its increased utilization. Table 5 briefly summarizes the characteristics of this facility.

Traffic. Traffic data for 1979 and 1980 were obtained from the U.S. Corps of Engineers Waterborne Commerce Statistics. For earlier years, OCS-SESP reports were used, particularly Technical Report 58 by Peat, Marwick and Mitchell & Co., which uses the same Corps of Engineers data. Attempts were made to verify these data with the operators of the three major port facilities in **Unalaska-Dutch Harbor**, but there was a great reluctance to share their information with the Consultant since they felt it was confidential and, if used, would provide information to their competition. Origin and destination data for 1978 through 1980 are given in Appendix A.

The throughput tonnage for the period 1968 to 1980 at **Unalaska-Dutch Harbor**, which is referred to by the Corps of Engineers as "Iliuliuk Harbor," is given in Table 6. This table shows : 1) an occasionally large variation in throughput tonnage from one year to the next, i.e., 1968-1969, 1974-1975 and 1979-1980, and 2) a four time increase in throughput tonnage over a twelve year period, i.e., an average compounded growth rate of over 12 percent. (Table 7 shows the throughput tonnage by major commodity group between 1972 and 1980). Much of the growth in throughput tonnage is due to the transportation and transshipment

TABLE 5

PORT FACILITY INVENTORY - UNALASKA/DUTCH HARBOR - CAPTAINS BAY TANK FARM

**Name:** Captains Bay Tank Farm or Captains Bay Dock

owner: N/A

operator: Crowley Maritime

**Type:** T-head pier.

**Dimensions:** Jetty: 152 meters (500 feet)

Pier: 107 meter face (350 feet)

Depth along side: From 11.0 to 12.8 meters (36 to 42 feet)

Type of ship using the facility:

1. Barge typically 23 by 91 meters (76 by 300 feet) with 100,000 barrels.
2. Leased temporary basis to various.

Year constructed: 1940

Year **rehabilitated:** 1975

**Type of** construction: N/A

**Open** storage: N/A

**Warehouse (covered** storage):

1. 3 large storage sheds - each shed has 2 storage bays of 18 by 24 meters (60 by 80 feet).
2. Fuel storage tanks (10,000 barrels).

Cargo handling **equipment:**

1. Mantowac Crane
2. Forklifts
3. Trucks and trailers

**Cargo handling** rate: (tons/hour or containers/hour)

Rated or maximum: Container- Gantry crane: n/a

Break bulk- Gantry crane: n/a

Average: Container- 15-25 containers\ hour

Break bulk- 15-20 tons/hour, i.e., 20 picks per hour

**Operating Parameters:** N/A

**Storage(days in storage area):**

	<u>UNLOADED GOODS</u>	<u>CUT-GOING GOODS</u>
Container:	N/A	N/A
Break:		

Sources: Technical Report No. 58; Louis Berger & Associates, Inc.

TABLE 6

TOTAL THROUGHPUT TONNAGE AT ILIULIUK HARBOR<sup>a</sup>

1968 - 1980

<u>YEAR</u>	<u>TONNAGE</u>
1968	120,980
1969	263,905
1970	251,978
1971	245,163
1972	190,109
1973	163,586
1974	156,477
1975	300,953
1976	349,760
1977	342,324
1978	379,293
1979	580,057
1980	473,946

<sup>a</sup>The term "Iliuliuk Harbor" is used by the Corps of Engineers to refer to all bays and harbors in the Unalaska-Dutch Harbor area.

Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics, Part 4. For the period 1968-1978, data are taken from Technical Report No. 58, (Peat, Marwick, Mitchell & Company). 1981.

TABLE 7

THROUGHPUT TONNAGE BY MAJOR COMMODITY GROUPS - ILIULIUK HARBOR<sup>a</sup>  
1972 - 1980

<u>YEAR</u>	<u>PETROLEUM PRODUCTS<sup>b</sup></u>	<u>FOOD PRODUCTS<sup>c</sup></u>	<u>FISH/ Shellfish</u>	<u>ALL OTHER COMMODITY GROUPS<sup>e</sup></u>	<u>ANNUAL TOTAL</u>
1972	173,460	36	14,508	2,105	190,109
1973	144,555	3,244	13,086	2,721	163,586
1974	88,790	3,237	61,429	4,021	157,477
1975	272,222	5,598	20,563	2,570	300,953
1976	321,290	9,241	15,638	3,591	349,760
1977	318,298	10,813	6,226	6,987	342,324
1978	333,240	6,053	28,329	10,879 <sup>f</sup>	378,501
1979	495,618	22,831	41,043	20,565	580,057
1980	420,719	21,269	21,930	20,028	483,946

<sup>a</sup>The term "Iliuliuk Harbor" is used by the Corps of Engineers to refer to all bays and harbors in the Unalaska/Dutch Harbor area.

<sup>b</sup>Includes gasoline, jet fuel, fuel oil and miscellaneous petroleum and coal products.

<sup>c</sup>Includes salt, prepared fish, alcoholic beverages, groceries and miscellaneous food products.

<sup>d</sup>Includes fresh fish and fresh shellfish.

<sup>e</sup>Includes all other commodities.

<sup>f</sup>Excludes local dock-to-dock transfer: 396 tons shipped and 396 tons received.

Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics, Part 4. For the period 1978-1980, data are taken from Technical Report No. 58, (Peat, Marwick, Mitchell & Company, 1981).

of petroleum products which have increased at nearly 12 percent per year since 1972. Since 1972, dry goods have grown even more rapidly, from 9 percent of the total throughput in 1972 to about 13 percent in 1980. Petroleum products still remain, however, the dominant cargo in terms of the tonnage handled at Unalaska-Dutch Harbor.

Between 1972 and 1980, throughput tonnage of fish and shellfish peaked in 1974 with 61,000 tons and dropped to a low of 6,000 tons in 1977. Fishing tonnages can vary widely due to biological and market conditions. Between 1973 and 1974 the fish product throughput tonnage increased 4.7 times; a similar increase occurred between 1977 and 1978. In the analysis of the impact of the OCS oil and gas development on the port of Unalaska-Dutch Harbor, the occurrence of random peak demands for port facilities due to the fishing industry will be considered.

Although petroleum products do not seem to follow this same type of cyclical trend, year-to-year changes in petroleum product throughput have been as much as 160,000 tons (1978-1979).

Table 8 compares foreign imports and exports with domestic freight movements. Exports from Unalaska-Dutch Harbor, are mainly fish products, represent over 90 percent of the shipments of fish and shellfish. Thus, overseas trade in fish products is an important aspect of the dry cargo movements through this port.

Petroleum product shipments to Unalaska-Dutch Harbor originate in Seattle and California. The tonnages of fuel transshipped by destination for 1978 through 1980 are given in Table 9. The variations in the shipment of petroleum products from Unalaska-Dutch Harbor are due to a number of factors:

- 1) Variation in fishing activity,
- 2) Variation in construction activity,
- 3) Weather: A colder winter will result in larger shipments in the next shipping season in order to restore a normal supply of fuel for the oncoming winter. This is particularly true of communities which are ice bound during the winter. The converse of this statement is true; mild winters will result in smaller and more frequent shipments, and

TABLE 8

**FOREIGN VERSUS DOMESTIC PRODUCTS - ILIULIUK HARBOR**

1979 - 1980

<u>YEAR</u>	<u>COMMODITY</u>	<u>FOREIGN</u>		<u>DOMESTIC</u>			<u>NET RECEIPTS- SHIPMENTS!</u>
		<u>IMPORTS</u>	<u>EXPORTS</u>	<u>RECEIPTS</u>	<u>SHIPMENTS</u>	<u>LOCAL<sup>a</sup></u>	
1978	Total	61	21,125	224,407	132,908	n/a	91,499
	Petroleum	--	---	213,149	120,091		93,058
	Total Less Petroleum			<b>11,258</b>	12,817		-1,559
	Fishery Products	--	20,951	<b>1,054</b>	6,324		-5,270
	Other	61	174	<b>10,204</b>	6,493		<b>3,711</b>
1979	Total	4,480	42,888	269,797	166,699	96,193	103,098
	Petroleum	--	--	249,037	150,387	96,193	98,650
	Total Less Petroleum			20,760	16,312		4,448
	Fishery Products	8	37,721	1,472	1,842		-370
	Other	4,472	5,167	19,288	14,470		4,818
1980	Total	10,313	21,629	234,061	179,936	38,007	54,125
	Petroleum			219,733	162,979	38,007	56,754
	Total Less Petroleum			14,328	16,957		-2,629
	Fishery Products		19,437	1,753	740		<b>1,013</b>
	Other	10,313	2,192	12,575	16,217		03,642

<sup>a</sup>Local = dock-to-dock transfers.<sup>b</sup>Excludes total amount of local dock-to-dock transfers.

Source: Unpublished Data. Advance Information: Pacific Region Freight Traffic  
Tables, CY 1980. Corps of Engineers.

TABLE 9

DESTINATIONS AND TONNAGE OF OUTBOUND PETROLEUM PRODUCTS FROM UNALASKA-DUTCH HARBOR

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>AVERAGE</u>
<u>North &amp; Western</u>				
<b>Bethel/McGrath</b>	40,679	32,225	44,419	
Nome	---	10,708	16,303	
<b>St. Michael</b>	---	7,402	7,971	
Bering Sea	17,848	33,245	34,710	
Subtotal	58,537	83,580	103,403	81,837
 <u>Bristol Bay, Alaska</u>				
<u>Peninsula &amp; Aleutian</u>				
<b>Naknek</b>	16,022	21,831	<b>21,748</b>	
<b>Dillingham</b>	13,410	12,193	5,602	
<u>Alaska Peninsula N. &amp;</u>				
<u>S. Side</u>	13,288	19,008	12,795	
Aleutian Islands	10,423	7,953	13,214	
King Cove	327	399	1,358	
Subtotal	53,470	61,384	54,717	56,523
 <u>Pribilof Islands</u>	3,287	3,613	3,656	3,522
 <u>Other</u>				
Valdez	242	---	---	
Kodiak	4,656	---	1,071	
Homer		1,659	---	
Other		141	102	
	4,807	1,810	1,173	N/A
 <u>Local Transfer</u>	<u>131</u>	<u>96,193</u>	<u>38,007</u>	<u>N/A</u>
TOTAL	120,222	246,580	200,966	N/A

Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics, Part 4.

- 4) Variations in the requirements to refuel local and foreign fishing vessels and floating processors.

The fourth factor might explain the drop in the local consumption of fuel (net receipts less shipments) from 91,000 in 1979 to 57,000 tons in 1980 (Table 9) as the refueling of ships at Unalaska-Dutch Harbor would appear in Corps statistics as a local consumption of petroleum products. This suggests that receipts (inbound tonnages) of petroleum products could vary to a much greater extent than the data would indicate here.

Ship Activity. Table 10 illustrates the annual level of vessel activity in Iliuliuk Harbor (Unalaska-Dutch Harbor) for the period 1972 through 1980. After 1976 there was a large drop in dry cargo ships using Iliuliuk Harbor, a change which reflected the use of larger ships. The number of tankers using Iliuliuk Harbor has decreased in the last few years indicating larger loads per shipment and a lower utilization of the port facilities.

#### Port of Cold Bay

Infrastructure. Cold Bay has recently been incorporated as a second class city (a political unit having corporate status of self government, but no school responsibilities, and requiring voter approval for tax increases); it is located about 48 kilometers (30 miles) from the southwestern tip of the Alaska Peninsula. This community, with an estimated 1981 population of 175, has an airport, government offices, residential area and a port located at the east of the community. The regional airport at Cold Bay serves as the economic base of the town. Most of the tonnage of marine freight is used to refuel aircraft.

The State of Alaska owns and operates a T-head pier constructed of steel piles and prestressed deck paneling; a description of this facility is given in Table 11. Mooring dolphins are located on either side of the structure. Table 11 also describes the physical characteristics of the dock, and Figure 6 shows the location of this facility vis a vis one proposed in the draft DOT/PF Aleutian and Southwest Alaska Coast Ferry Study. The conclusions in this report are subject to change.

TABLE 10

**ILIULIUK HARBOR VESSEL ACTIVITY<sup>a</sup>**  
1972 - 1980

YEAR	INBOUND			OUTBOUND		
	DRY CARGO	TANKER	TOW OR TUG	DRY CARGO	TANKER	TOW OR TUG
1972	709	58	50	712	59	53
1973	707	26	27	708	28	27
1974	928	20	52	929	21	52
1975	877	60	43	875	62	42
1976	89	64	238	85	66	86
1977	150	54	63	147	45	67
1978	SPV <sup>b</sup>	18	78	185	19	73
	NSPV <sup>c</sup>	14	---	22	22	---
	Sum	32	78	207	41	73
1979	SPV <sup>c</sup>	20	100	286	33	96
	NSPV <sup>c</sup>	41	---	46	65	---
	Sum	61	100	332	98	96
1980	SPV <sup>b</sup>	10	89	353	10	99
	NSPV <sup>c</sup>	26	22 <sup>d</sup>	59	27	13 <sup>d</sup>
	Sum	36	111	412	37	112

<sup>a</sup>Includes vessel activity at all docks in Unalaska/Dutch Harbor due to the manner in which the Corps of Engineers collects and maintains data.

<sup>b</sup>SPV = Self propelled vessel.

<sup>c</sup>NSPV = Non-self propelled vessel.

<sup>d</sup>Other vessel.

Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics, Part 4. For the period 1972 through 1977 data were taken from Technical Report No. 58, (Peat, Marwick, Mitchell and Company, 1981).

TABLE 11

**PORT FACILITY INVENTORY - COLD BAY PIER**

**Name:** Cold Bay Pier

Ownership: State of Alaska                      operator: DOTPF

**Type:** T-head pier.

Dimensions: Jetty length: 556 meters (18 24 feet)

**Pier:** 12.1 X 30.5 meters (40 by 100 feet)

Depth along side: 9.1 meters (30 feet)

**Type** of ship using the facility:

1. Structure is mainly used to unload petroleum products for airport facilities at Cold Bay - Tug and barge.
2. Alaska Marine Highway System

Year Instructed: N/A

Year rehabilitated: 1981

Type of construction: Steel piles and pre-stress concrete plank decking.

Open storage: N/A

Warehouse (covered storage): N/A

1. Tank farms on and off site.
2. 4.0 million gallons of aviation fuel.
3. 0.3 million gallons of other.

**Cargo handling equipment:**

1. 1-10 inch diameter fuel line.
2. 3-8 inch diameter fuel line 6.

- **Cargo** handling rate: (tons/hour or containers/hour)  
Unloading: General: Ferry Roll-on/roll-off  
Loading: General: Ferry

- **Operating Parameters:** N/A

**Storage(days in storage area):** N/A

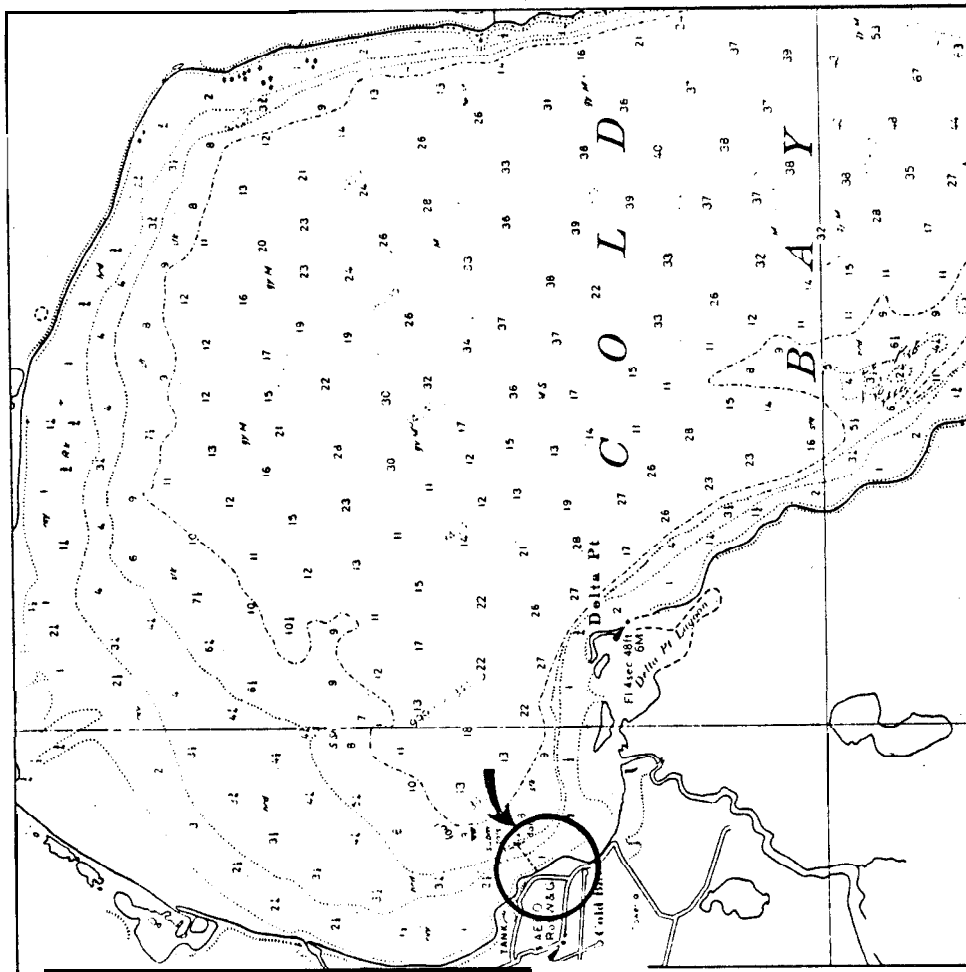
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Sources: Technical Report No. 58; Louis Berger & Associates, Inc.

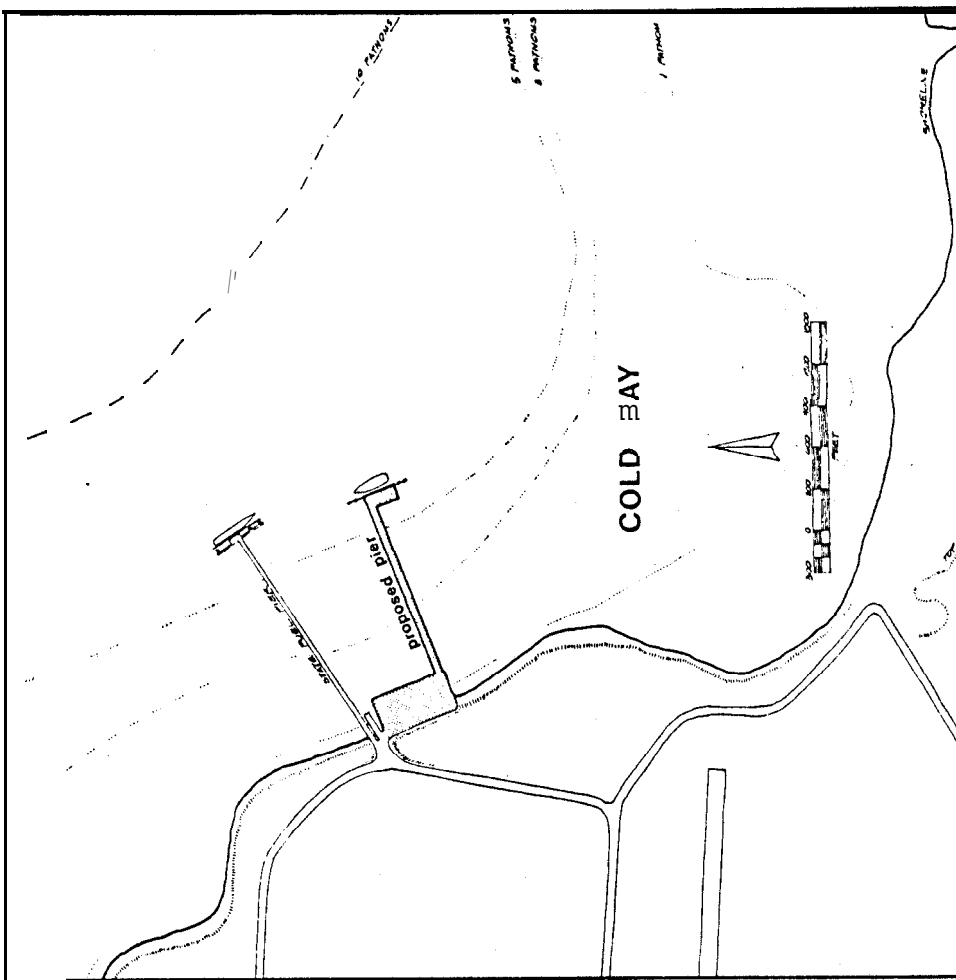
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VICINITY MAP



TERMINAL LAYOUT

TRANSPORTATION  
IMPACT ANALYSIS  
NAVARIN BASIN

PORT OF  
COLD BAY

FIGURE

SOURCE: ALEUTION AND SOUTHWEST ALASKA COASTAL  
FERRY STUDY REPORT. (DRAFT SUBJECT TO CHANGE).

Navigation through the channel to Cold Bay is described as difficult, and the United States Coast Guard (Coast Pilot 9, 1981) states that "mariners should exercise extreme caution when transiting this area in winter . . . ." A reef extends almost across the entrance of the bay, further complicating navigation into and out of the bay.

The weather at Cold Bay is characterized as poor with winds frequently averaging 20 miles per hour for 24 hour periods due to the high frequency of **cyclonic** storms (U.S. Coast Guard, Coast Pilot 9).

Traffic, According to the Corps of Engineers Waterborne Commerce Statistics, the total throughput tonnages at Cold Bay for the period 1978 to 1980 are:

1978	12,524 Tons
1979	8,605 Tons
1980	<u>5,426 Tons</u>
3 year average	8,515 Tons

Petroleum products represent the bulk of the throughput tonnage during this period:

1978	10,719 Tons (76%)
1979	8,545 <b>Tons</b> (63%)
1980	<u>3,602 Tons</u> (37%)
3 year average	7,622 <b>Tons</b> (65%)

The petroleum products originate mainly from Unalaska-Dutch Harbor (the percentages above give the quantities coming from this location) and from Valdez and Seattle. Unalaska-Dutch Harbor became less important as a source of fuel in 1980. The drop in fuel consumption at Cold Bay between 1978 and 1980 is caused by Flying Tiger no longer using Cold Bay as a refueling point for its polar flights.

Cold Bay is also used as a transshipment point between marine and air modes for construction materials (lumber, wood, building products, and machinery). Tonnage for these materials varies considerably from year to year as shown below:

1978	1,764 Tons (100%)
1979	. -- Tons ---
1980	<u>598</u> Tons (53%)
3 year average	787 Tons (87%)

These figures include construction materials used **at** Cold Bay as well as those transshipped. Typically, most of these materials originate from Seattle (as the above percentages indicate); however, in 1980, 47 percent was shipped from Homer.

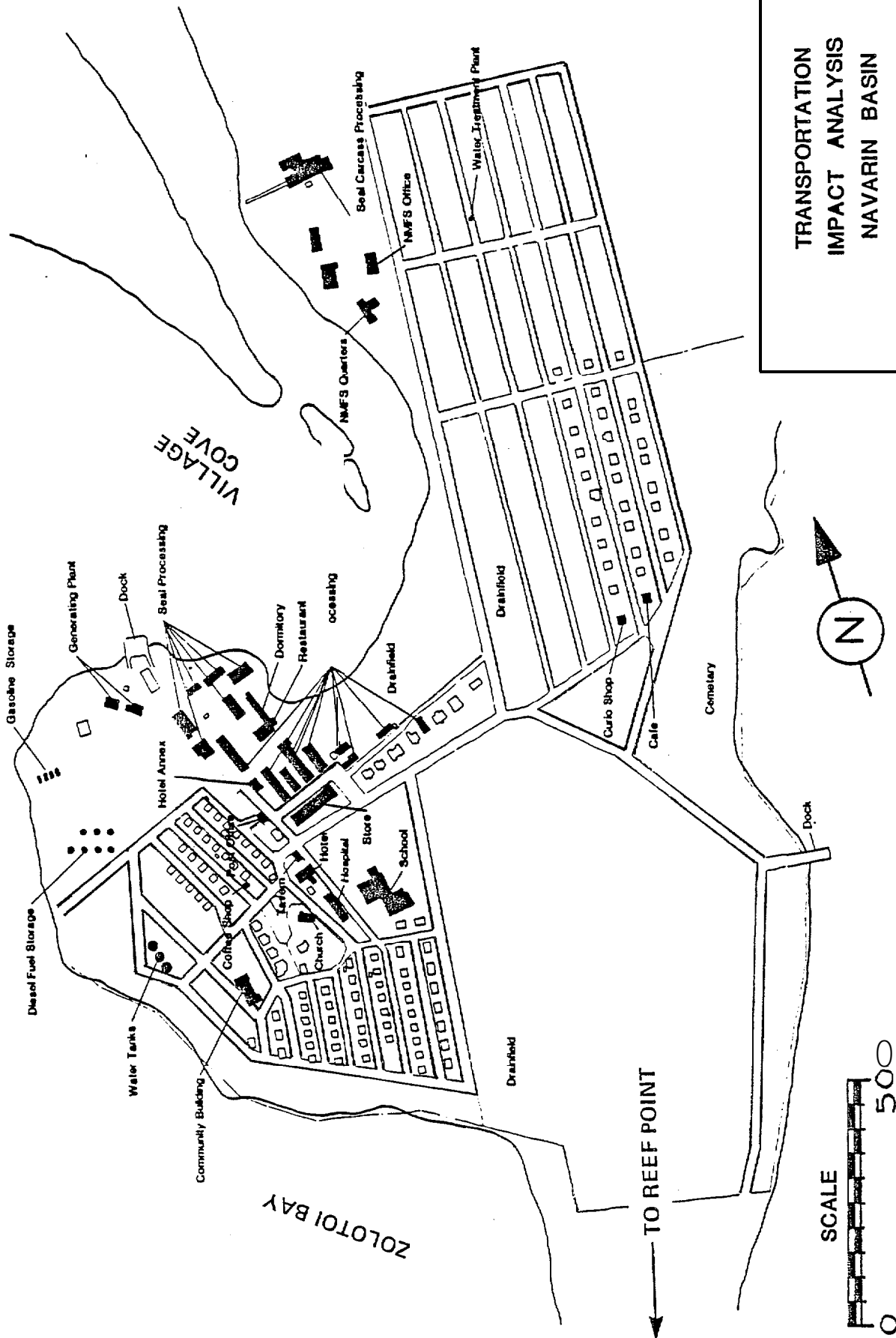
In 1980, the Alaska Marine Highway System initiated a single stop in Cold Bay during the summer. Service was expanded to 4 trips in 1981.

### St. Paul

Infrastructure. St. Paul, one of five Pribilof Islands, is located in the Bering Sea about 384 kilometers (240 miles) north-northwest of Unalaska-Dutch Harbor. St. Paul with an area of 140 square kilometers (44 square miles) is the largest in the island group. The Pribilofs contain the world's largest fur seal breeding grounds and the fur seal industry has been and is presently the major economic base of the islands.

There are no sheltered harbors in the Pribilof Islands. However during the summer months when prevailing winds are from the northeast Village Cove on St. Paul Island is a good anchorage in all but severe southwestern winds (u\*s. Coast Guard, Coast pilot 9, 1981). Figure 7 shows the location of the dock at Village Cove; another dock, located on the other side of the island, is used as an alternative unloading facility. Neither is capable of unloading cargo from either a medium or a deep draft vessel. The dock at Village Cove is 30.5 meters (100 feet) wide and has water depths of 0.9 to 1.2 meters (3 to 4 feet). (Technical Report No. 58, Peat, Marwick, Mitchell & co., 1981). It has a skid mounted crane with a 10-ton capacity.

Cargo is lightered to the dock by small boats or by barge with an average load of about 5 tons per trip. Fuel can be pumped from the barge. There is no storage space at the dock so the cargo must be delivered directly from the dock to its



TRANSPORTATION  
IMPACT ANALYSIS  
NAVARIN BASIN

PORT OF  
SAINT PAUL HARBOR

FIGURE 7

Source: Management and Planning Services, 1980

consignee. The Corps of Engineers has prepared a feasibility study for the development of a sheltered harbor with a dock capable of offloading medium draft vessels. Figure 6 gives the preferred alternative layout of the harbor. This analysis of traffic and port capacity assumes this facility will be built by 1989.

Traffic. The U.S. Army Corps of Engineers waterborne traffic data for St. Paul does not include traffic from the Bureau of Indian Affairs (BIA) ship North Star III, which made two stops there in 1980. This traffic should be in the order of magnitude of several hundred tons. To the extent that this traffic is not included, the following traffic data understates the amount of throughput:

1978	4,175 Tons
1979	2,190 Tons
1980	<u>3,309</u> Tons
3 year average	3,465 Tons

The inbound dry traffic to St. Paul originates in Seattle. Petroleum products originate from Unalaska-Dutch Harbor. The total throughput tonnage of petroleum products from 1978 through 1980 is as follows:

1978	2,381 Tons
1979	2,768 Tons
1980	<u>2,697</u> Tons
3 year average	2,615 Tons

During 1980, St. Paul was served four times by the Alaska Marine Shipping Company (AMS); two times by the North Star III; and once by the Crowley Cool Barge, for a total of seven trips. There is no marine passenger service available. AMS has a contract with National Marine Fisheries Services (NMFS) which runs another four years and gives this company exclusive private carrier rights to serve St. Paul. AMS is required to use the vessel "Snowbird" because its other ships are assigned to fishery type consignees (Technical Report 58, Peat, Marwick, Mitchell & CO., 1981.)

## MARINE SERVICES

### Marine **Operators** and Their Route Structure

From an operational perspective, the majority of marine carriers serving the study area can most easily be classified under two general headings: interstate and international ocean shippers - in other words, those coming from or going to areas outside of the state and study area - and intrastate coastal shippers and coastal and lightening transportation services which operate within the study area. With the exception of foreign vessels (serving the area in the export of fish products to the Orient), the Alaska Marine Highway System (moving passengers to selected points in the area), and the BIA's operation of North Star III, all carriers are regulated by the Federal Maritime Commission (FMC) or the Interstate Commerce Commission (ICC) or by both.

In addition to the two general categories indicated above, carriers serving the study area can be further differentiated in terms of the type of service they provide and the type of cargo they transport. Common carriers, which publish scheduled routes and sailing dates, and contract carriers, catering to major shippers such as petroleum companies, both serve the study area. Similarly, some carriers serve specific industries, e.g., the fishing industry, or transport primarily a particular commodity or cargo type such as breakbulk, container, or liquid bulk cargos.

A description of each carrier's operations and the nature of its service appears in the following sections. A map for each carrier, depicting the communities served and the route structure for that service, is also presented.

### Interstate Carriers

Three types of interstate and international carrier operations can be differentiated: direct shipments to a single point, line hauls to major transfer points, and "milk runs." The first of these are normally charter operations, an example of which would be a shipment to Prudhoe Bay or Nome of oil drilling equipment. Line hauls are typical of most scheduled common

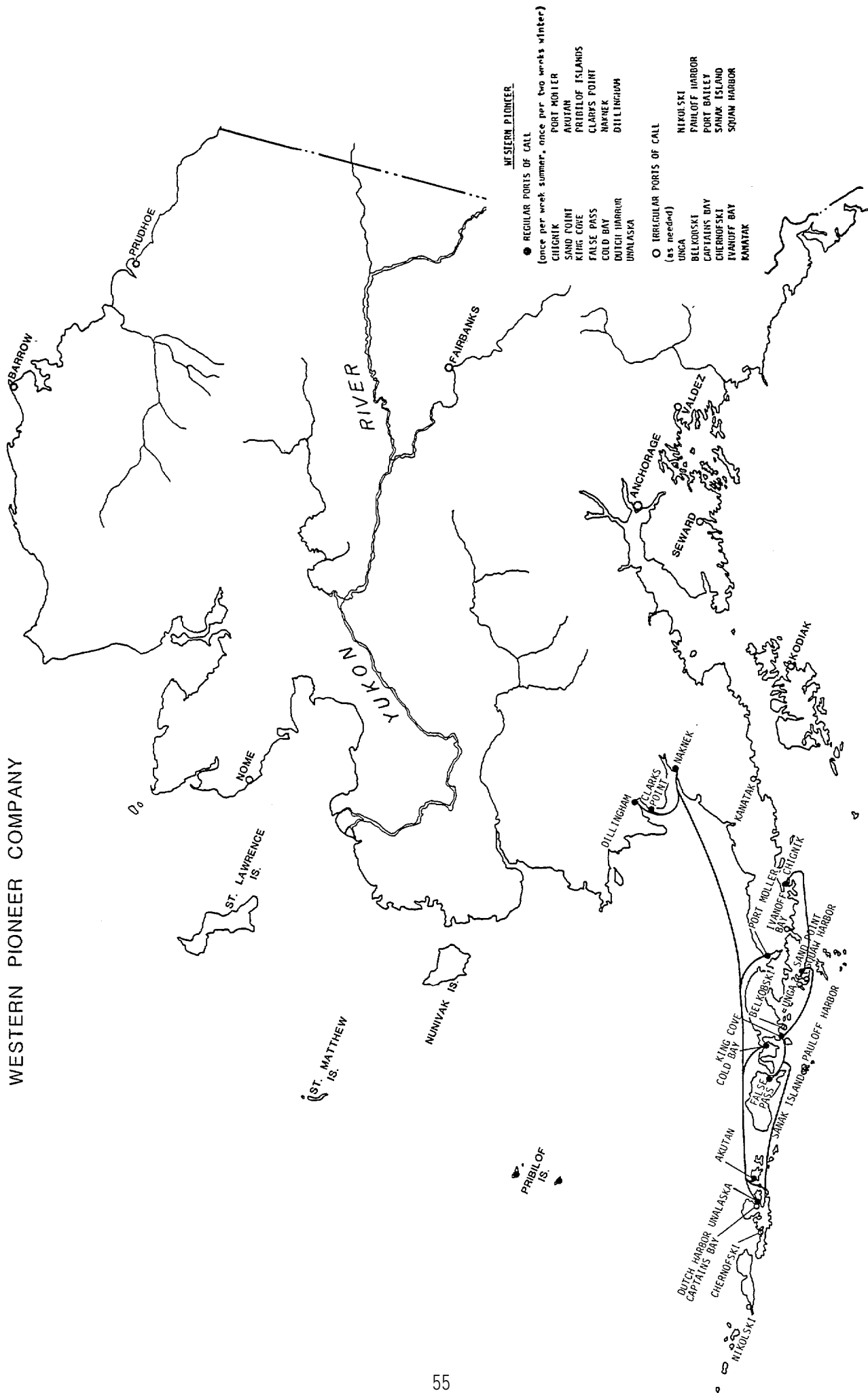
carriers, and entail the movement of cargo to a main service or transfer point such as Bethel, where it is then lightered to nearby communities. The "milk run" serves a number of customers at transfer points and intermediate locations. All of these operations are similar in that cargo is coming from or going to a destination outside the study area and the state. Generally the origin and home port of these carriers are in the Seattle area. Carriers are described below.

Western Pioneer. Western Pioneer operates a breakbulk service directed toward serving fisheries and fishery-related communities on the Alaska Peninsula and in the Bristol Bay area, and on the Kenai Peninsula and Kodiak Island outside the study area. During the fishing season, or from mid-April until mid-October, Western Pioneer maintains service every six days between the Seattle area and Unalaska-Dutch Harbor and to a number of points on the Alaska Peninsula and Bristol Bay. This service is reduced to approximately once every two weeks during the remainder of the year. Other points in the study area are served on an irregular basis. Figure 8 indicates Western Pioneer's current route structure.

Aleut Alaska Shipping Company. The Aleut Alaska Shipping Company operates a breakbulk service out of Seattle to 44 Alaskan ports with a primary emphasis on the Alaska Peninsula Aleutian Chain. Unalaska-Dutch Harbor is its principal port-of-call. Approximately 22 to 24 round trip voyages to Dutch Harbor and the study area are made per year and 4 to 6 trips are made to the Pribilofs. Northbound cargo is generally composed of various supplies for fisheries and processors. Seafood is shipped southbound. Principal ports served within the study area include Chignik, Sand Point, Squaw Harbor, King Cove, Cold Bay, False Pass, Akutan, Dutch Harbor, Herendeen Bay, Port Moller, Port Heiden, Egegik, Naknek, Clarks Point, Togiak and the Pribilof Islands. The Pribilof Islands are served under obligation to the U.S. Department of Commerce; both general cargo and sealskins are transported from that area. A minimum of four sailings occur annually under this contract. The Aleut Alaska Shipping Company is the only common carrier serving the Pribilofs under this exclusive agreement.

In addition to its common carrier operations, the Aleut Alaska Shipping Company is also engaged as a contract carrier to seafood processors who charter it on a time or voyage basis to

FIGURE 8  
WESTERN PIONEER COMPANY



move both general cargo and seafood products. Figure 9 indicates Aleut Alaska Shipping Company's current route structure.

Northland Services. Northland Services provides a regularly scheduled, seasonal tug and barge service from April 1 to October 31. Within the study area, Northland services the Bristol Bay area, primarily Naknek, Dillingham, and Bethel during the course of 4 to 6 scheduled trips a year. In Western Alaska, Northland serves Nome, St. Michael/Unalakleet, Emmonak, Mt. Village/St. Mary's and Kotzebue during the course of 2 or 3 of these trips. Other ports in Western Alaska and the Bristol Bay area are served irregularly in conjunction with Northland shipments, as indicated in Figure 10. Northland also serves the Alaska Peninsula and Aleutian Chain on an irregular basis via Dutch Harbor. Outside the study area, Northland provides service to Anchorage, Kodiak, Valdez, and points on the Kenai Peninsula. Northland's shipments are composed primarily of container cargo, building materials and equipment and other general cargo. Northland does not ship bulk fuel. Figure 9 shows the route structure of Northland Services.

Sealand. Sealand provides line haul service directly from Seattle to Kodiak and Anchorage. Cargo destined for the study area is transshipped via a feeder vessel, the Aleutian Developer, from Kodiak to Chignik, King Cove, Sand Point, Squaw Harbor, Captains Bay/Unalaska-Dutch Harbor. This service carries primarily container and some breakbulk cargo approximately every 8 to 10 days. This vessel does not transport liquid bulk.

In addition to this feeder vessel, Sealand also provides a seasonal barge out of Seattle which serves various points on the Alaska Peninsula and in the Bristol Bay area as well as Kodiak Island ports outside the study area. This vessel transports primarily seafood from the study area or support equipment for the fishing industry and, consequently, operates in the Summer. Many of the places served by this barge are served on an inducement basis (see Figure 11).

American President Lines. American President Lines (APL) is a federally subsidized carrier operating deep-draft container vessels exporting fish products from Unalaska-Dutch Harbor as well as from Kodiak (outside the study area) to Japan and Korea. During the peak of the salmon and crab season, APL provides regularly scheduled ships to the Orient from Dutch Harbor on a weekly basis. At other times, service is bi-weekly.

FIGURE 9  
ALEUT ALASKA SHIPPING COMPANY

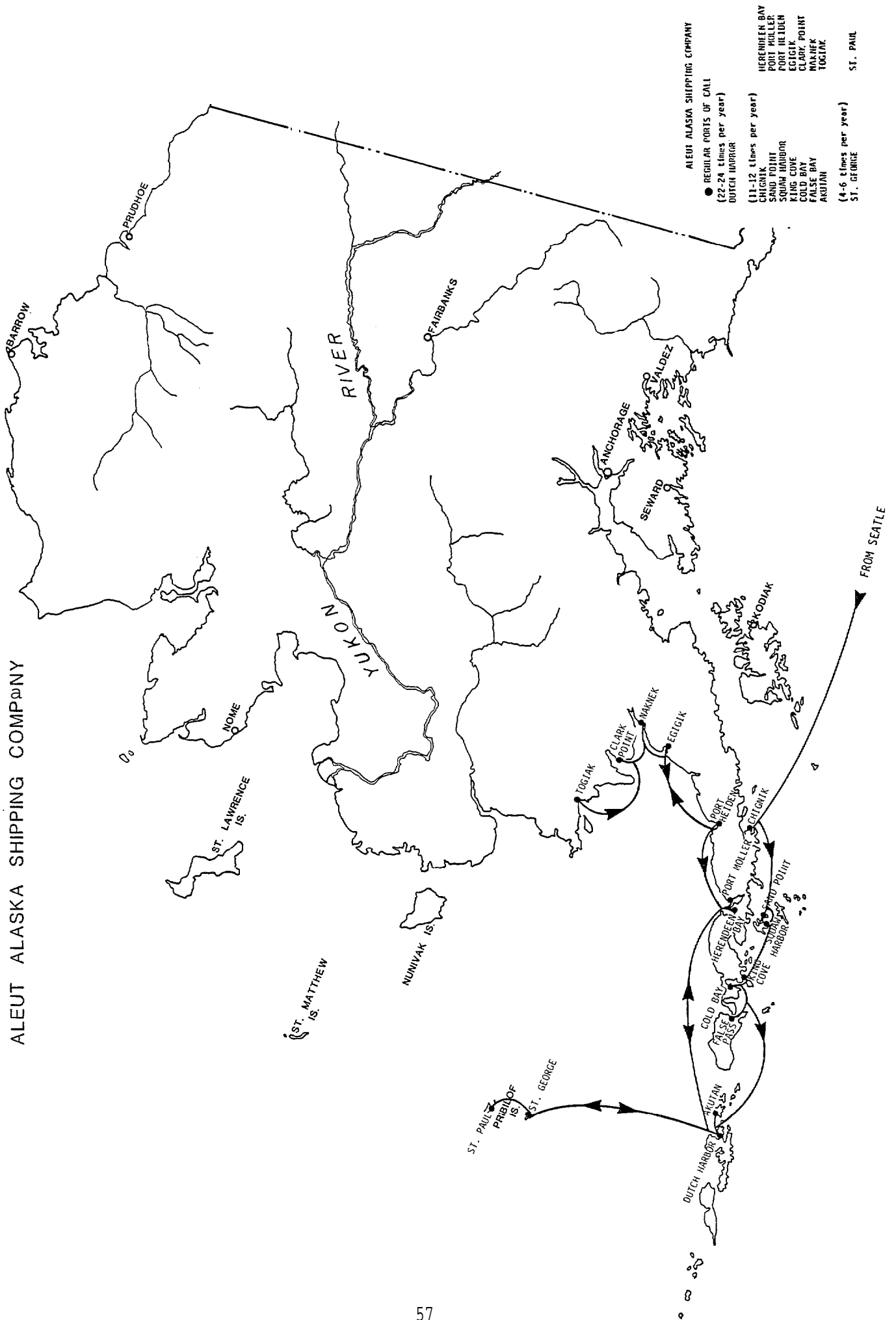


FIGURE 10  
NORTHLAND SERVICE ROUTE

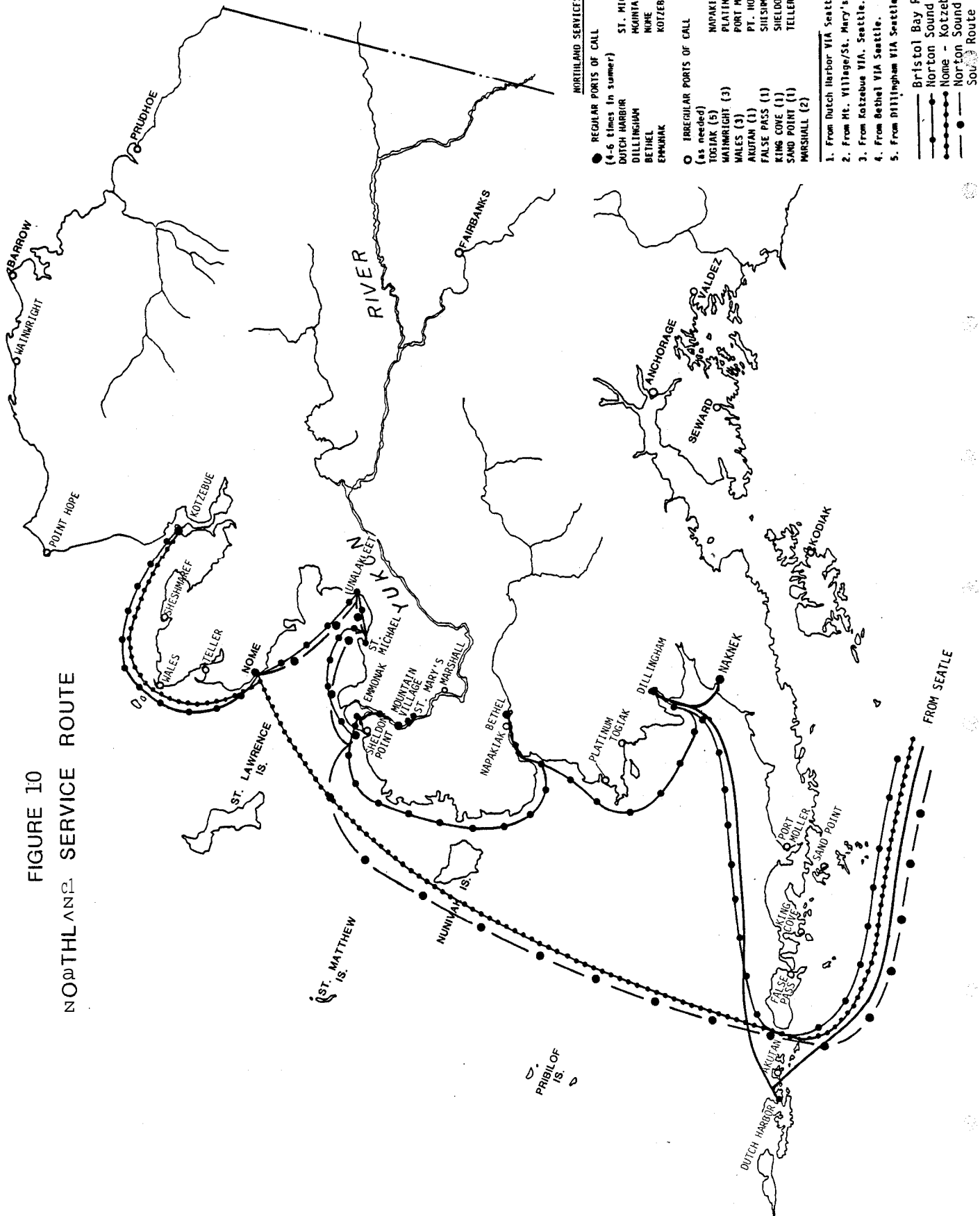
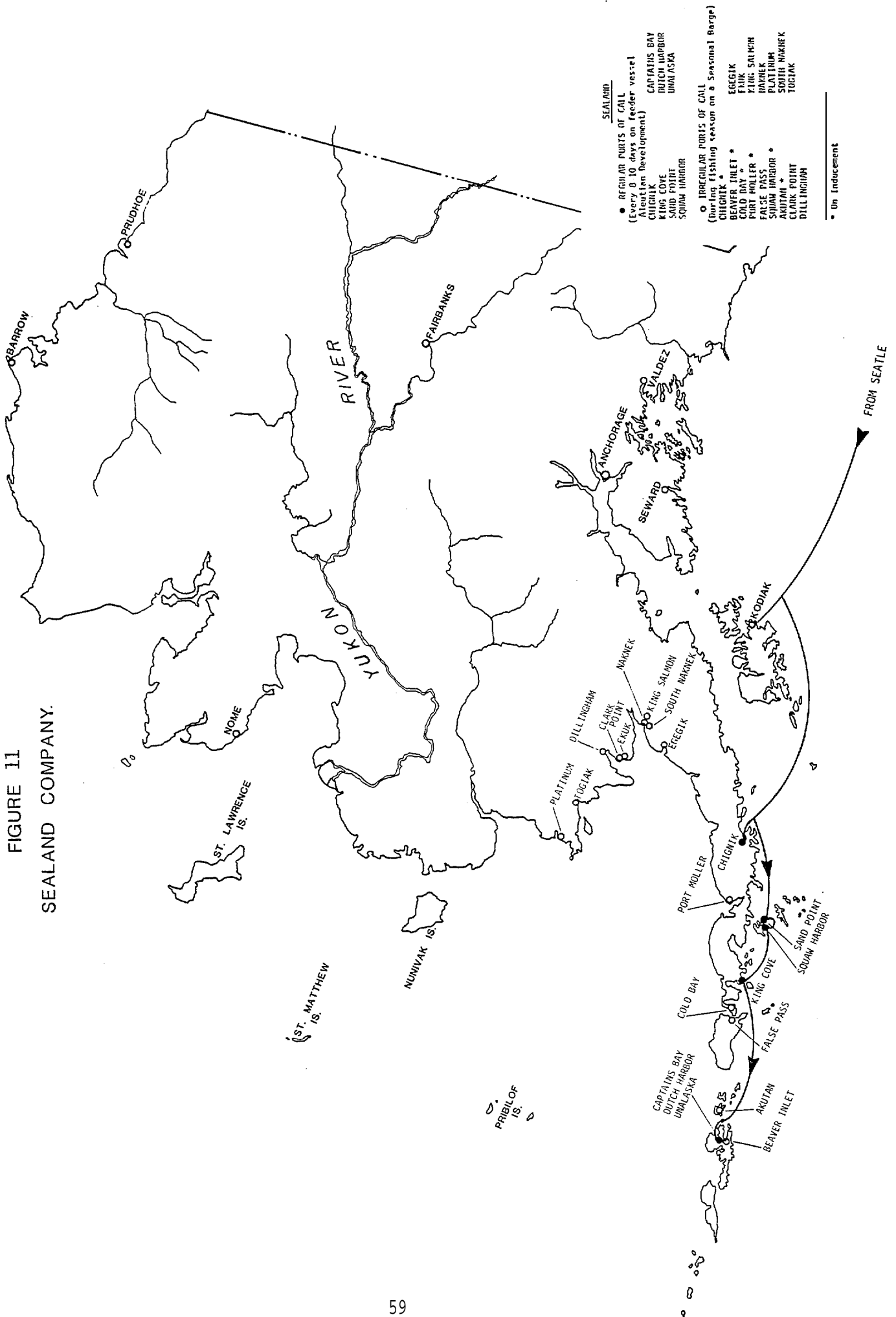


FIGURE 11  
SEALAND COMPANY.



APL interfaces with contract carriers which supply fish from around the Bristol Bay region as far north as Emmonak. Because APL receives subsidies under the 1936 Merchant Marine Act, it is prohibited from moving cargo between U.S. Ports. However, Senate Bill 682, currently under **consideration**, would amend sections of the Merchant Marine Act, and would enable APL to ship container goods between Seattle and Dutch Harbor, and potentially other Alaskan ports. Should this provision enacted, current carrier capacity to the area would increase significantly. Opposition to the legislation, however, comes from numerous other parties opposed to the measure due to its competitive effects on nonsubsidized carriers, and because they feel that current capacity is sufficient for the area's needs.

APL's cargo is primarily containerized, although it also operates breakbulk vessels to Unalaska-Dutch Harbor. As this moves primarily frozen **seafood**, APL vessels have reefer capabilities.

**Foss Alaska Lines.** Foss Alaska Lines operates two services within the study area. The Aleutian Chain service is a regularly scheduled operation from Seattle via **Sitka** which runs every 3 weeks to Unalaska-Dutch Harbor, Akutan, Adak and other points in the study area (**False Pass, Sand Point, Chignik, King Cove, Squaw Harbor**) on inducement. This service is restricted to ports having a harbor depth of at least 4.26 meters (14 feet) and a bulkhead or dock 12.92 meters (40 feet) wide with a crawler crane available on **site**.<sup>a</sup> The West Alaska service is a seasonally scheduled tug and barge operation serving Naknek, Dillingham, Bethel and Nome three to four times per year between May and August. In conjunction with this service St. Michael and Marshall are supplied on an as-needed basis. Outside the study area, Foss serves various points on Kodiak Island, the Kenai peninsula, and in Southeast Alaska.

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<sup>a</sup>Technical Report Number 58, Alaska OCS Socioeconomic Studies Program St. George Basin Petroleum Development Scenarios Transportation Systems Analysis.

Foss Alaska Lines carriers transport dry and refrigerated containers, as well as vehicles, machinery, construction material and other non-containerized cargo, although most of the cargo is containerized. Foss does not transport liquid bulk commodities. Figure 12 presents Foss Alaska Lines operations.

North Star III. The North Star III, operated by the Bureau of Indian Affairs, is a non-profit, self sustaining operation directed at serving approximately 60 remote communities not generally served by common carriers. The North Star III is a contract carrier which makes two "milk-run" voyages per year. The April-August voyage serves communities from the Aleutian Islands to Wales, and the August-October voyage serves communities north of Wales and as far east as Barrow. The Pribilofs and Atka are served if necessary and weather permitting. Figures 13 and 14 identify the operations of the North Star III and the communities it serves.

North Star III ships bulk petroleum products as well as general cargo. It is also the only surface operator in its service area that has reefer capabilities. Bulk petroleum is picked up in Unalaska-Dutch Harbor for each voyage.

One of the serious operational problems encountered by the North Star III involves scheduling shipments to the Pribilofs. Weather in the area is unpredictable and can preclude offloading of cargo. The associated delays can effect the entire schedule of the vessel. For this reason, the North Star III serves the Pribilofs if only necessary.<sup>a</sup>

Pacific Alaska Line-West. Pacific Alaska Line (PAL), a division of Crowley Maritime, operates a scheduled seasonal tug and barge service out of Seattle to the Alaska Peninsula, the Bristol Bay area, and the Bering Sea during the summer shipping season. PAL makes three trips to Dillingham, Bethel, and Nome, two to Kotzebue and the Yukon River, and one north of Kotzebue to

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<sup>a</sup>Technical Report Number 58, Alaska OCS Socioeconomic Studies Program St. George Basin Petroleum Development Scenarios Transportation Systems Analysis.

FIGURE 12  
FOSS ALASKA LINES

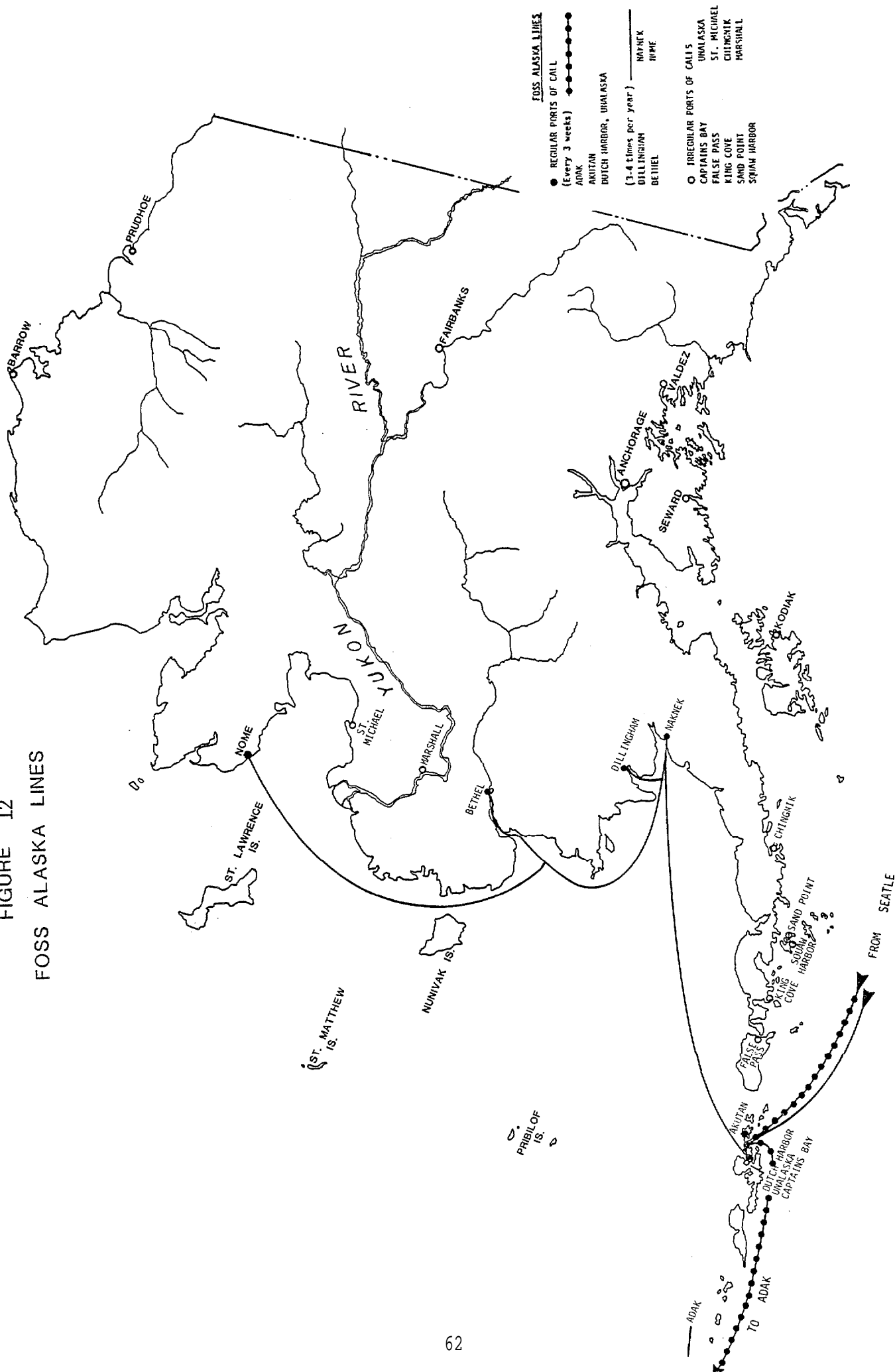


FIGURE 13  
NORTH STAR. III (1982 Season)

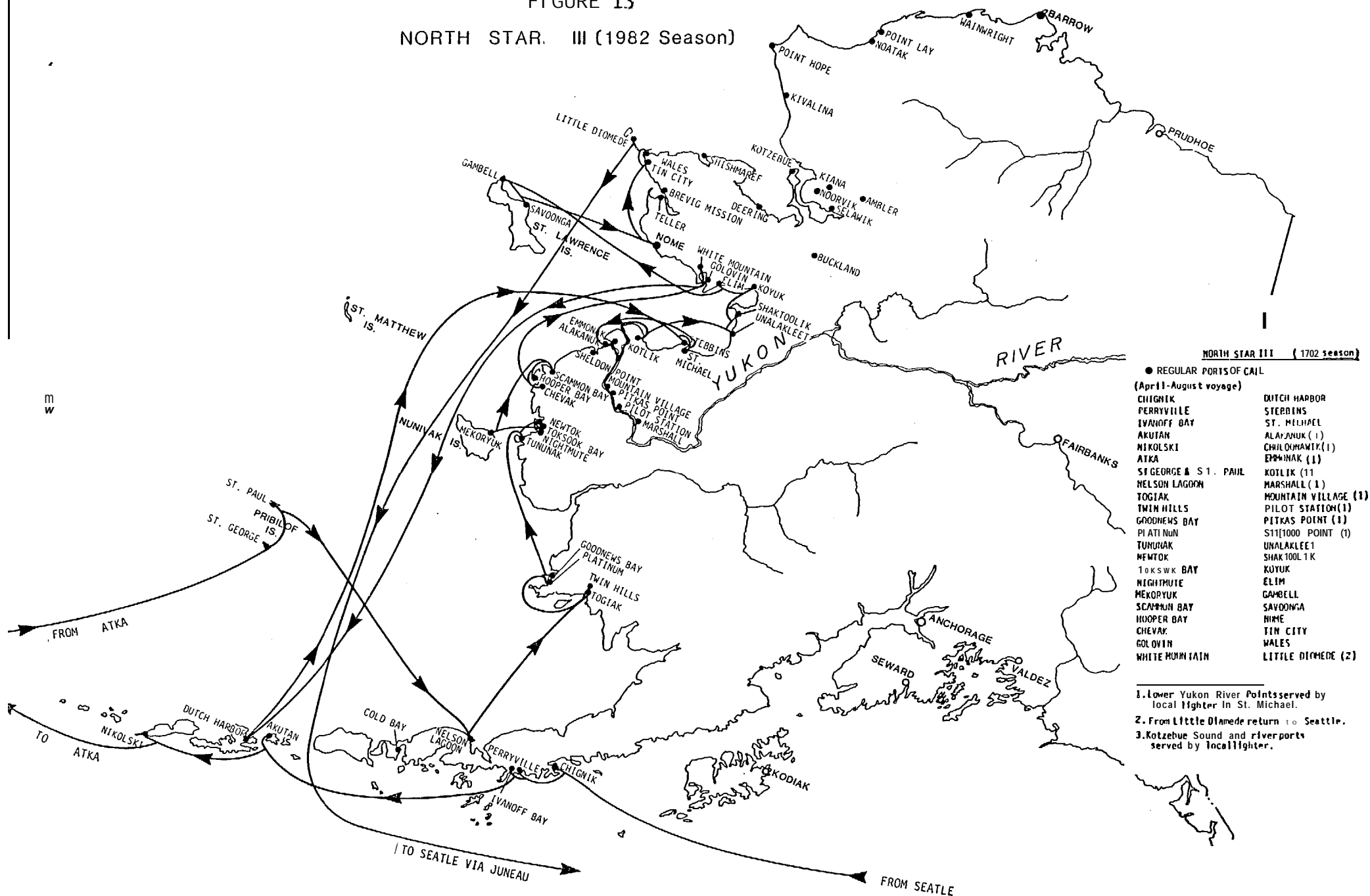
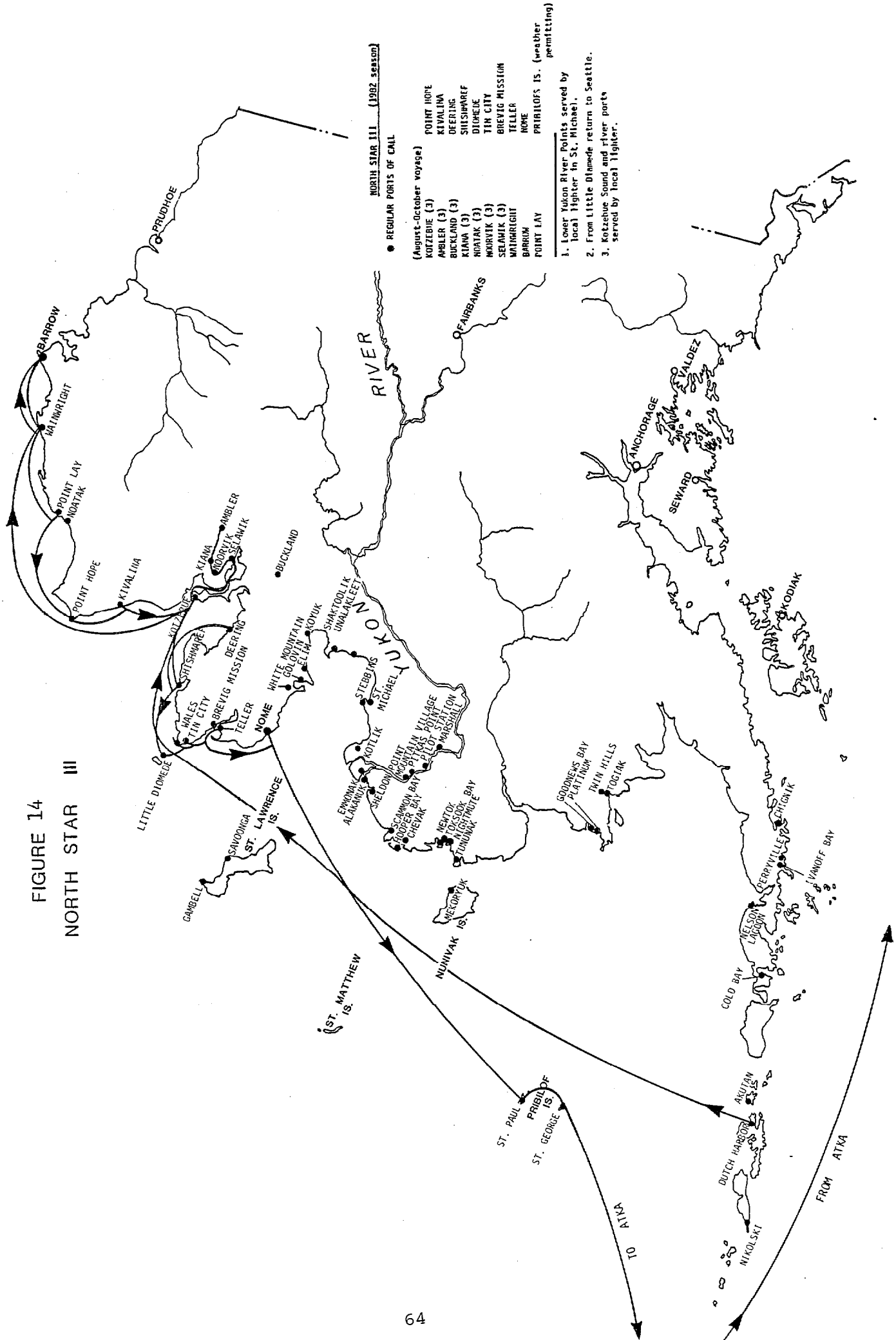


FIGURE 14  
NORTH STAR III



- the Chukchi Sea coast. In many cases PAL acts as a feeder service interfacing (a) at Nome with Arctic Lighterage Company facilities, the Public Health Service, (b) on the Yukon River with a pusher tug stationed at Sheldon Point to serve various Yukon River communities, and (c) at the Chukchi Sea near Pt. Hope with the "cool barge" to serve Pt. Hope, Pt. Lay, Wainwright, and Barrow (see Figure 15) Pacific Alaska Lines moves general and container cargo as well as liquid fuels.

- Alaska Puget United Transportation Companies (APUTCO) - Cool Barge.** The Alaska Puget United Transportation Companies (APUTCO), a subsidiary of Crowley Maritime, operates the annual military resupply to Western Alaska. Nicknamed "cool barge," this contract carrier's "milk run" operation serves not only defense institutions, but also federal agencies in Alaska such as the Coast Guard, FAA facilities, the public Health Service, and BIA locations not served by the North Star III.

- The "cool barge" operates from approximately May 15 to October 15. Supplies from Seattle are generally offloaded by barge at Captains Bay on a monthly basis throughout the season. Three other barges, one an oil carrying barge and the others combination barges, make trips from Captains Bay three times per week to various installations in Western Alaska. Cool barge operations vary little over time in terms of the locations serviced. Schedules and the routing for servicing areas might, however, vary slightly from year to year. Typical cool barge routes are shown in Figure 16, which displays cool barge operations in 1979.

- The cool barge delivers dry and reefer cargo as well as bulk petroleum and transships some cargo coming from Pacific Alaska Lines to Pt. Hope and communities further north and east along the Arctic Ocean.

- Standard Oil Company.** Standard Oil operates the Alaska Standard, a tanker which hauls bulk fuel on a contract basis from Unalaska-Dutch Harbor to various points on the Alaska Peninsula and Kodiak Island (outside the study area). Fuel is delivered on an as-needed basis directly to docks.

FIGURE 15

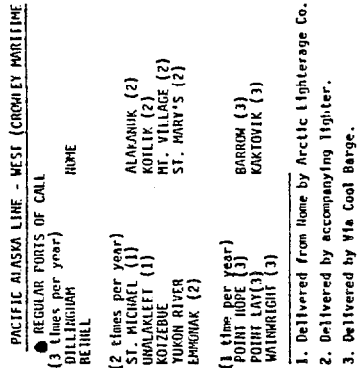
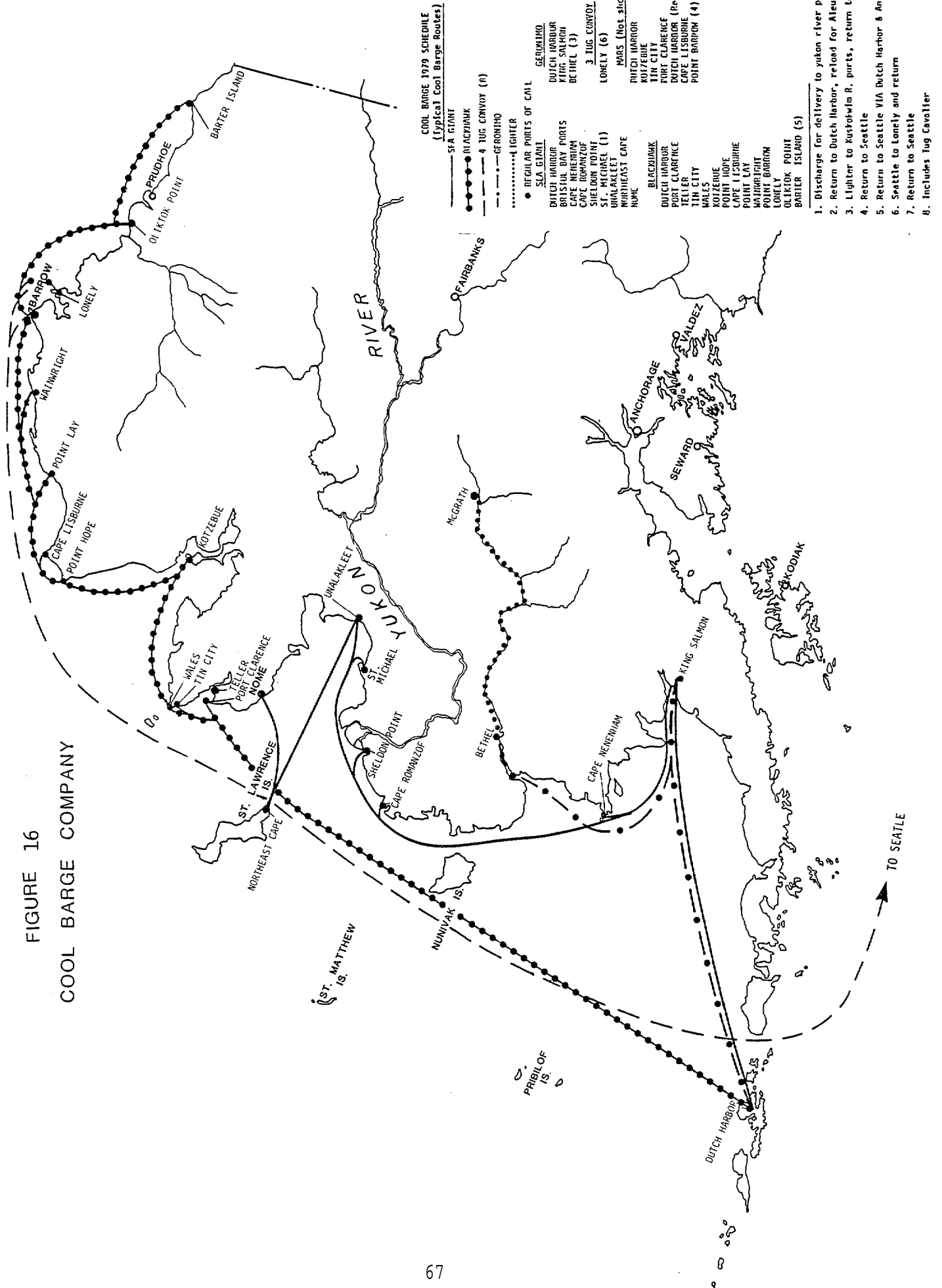


FIGURE 16  
COOL BARGE COMPANY



Puget Sound Tug and Barge Company. The Puget Sound Tug and Barge Company is a contract carrier for Standard Oil in Unalaska-Dutch Harbor. This carrier delivers bulk petroleum to redistribution centers in Western Alaska on a scheduled basis. Puget Sound Tug and Barge also transports construction material and equipment on a non-scheduled contract basis (see Figure 17).

Intrastate and Coastal Shippers and Coastal Lighterage and Rivering Operations. Carriers which perform coastal lighterage and rivering operations can be described as a secondary waterborne network. These carriers pick up and deliver their cargoes to ports served by the line haul carriers previously described. Both charter and common carrier services are provided by several such operators. These include United Transportation, Inc., Arctic Lighterage, Black Navigation, Sorenson's Barge Service, and Moody's Sea Lighterage. To a greater or lesser extent these operators not only perform ship-to-shore lightening but also have developed service networks to the smaller ocean and river communities. Operations of these carriers are greatly influenced by the uncertainty of ice break-up and freeze-up, seasonal and year-to-year fluctuations of water levels in river channels and depths at coastal landing points, seasonal traffic, routing, and scheduling considerations. For these reasons, operations vary from year-to-year in terms of the number of times a community is served and the time at which it is served. Because these carriers are often the sole surface carrier for many remote communities, they transport all types of cargo, the most important of which is generally liquid fuels. A brief description of each carrier follows.

Arctic Lighterage Company. Arctic Lighterage Company is a subsidiary of Crowley Maritime which, from Nome, serves the Norton Sound area, from Kotzebue, the Kobuk River, Kotzebue Sound, and the Arctic Ocean, and from Naknek and Bethel, locations in the Bristol Bay area. Figure 18 indicates Arctic Lighterage's service area and operations. Arctic Lighterage moves both dry and liquid cargo.

United Transportation, Inc. Like Arctic Lighterage, United Transportation, Inc. is affiliated with Crowley Maritime. From Bethel United Transportation serves the Kuskokwim Bay, St. Lawrence Island and the Kuskokwim River, as indicated in Figure 19. United Transportation moves dry and liquid cargoes.

FIGURE 17

STANDARD OIL COMPANY/PUGET SOUND  
TUG & BARGE COMPANY

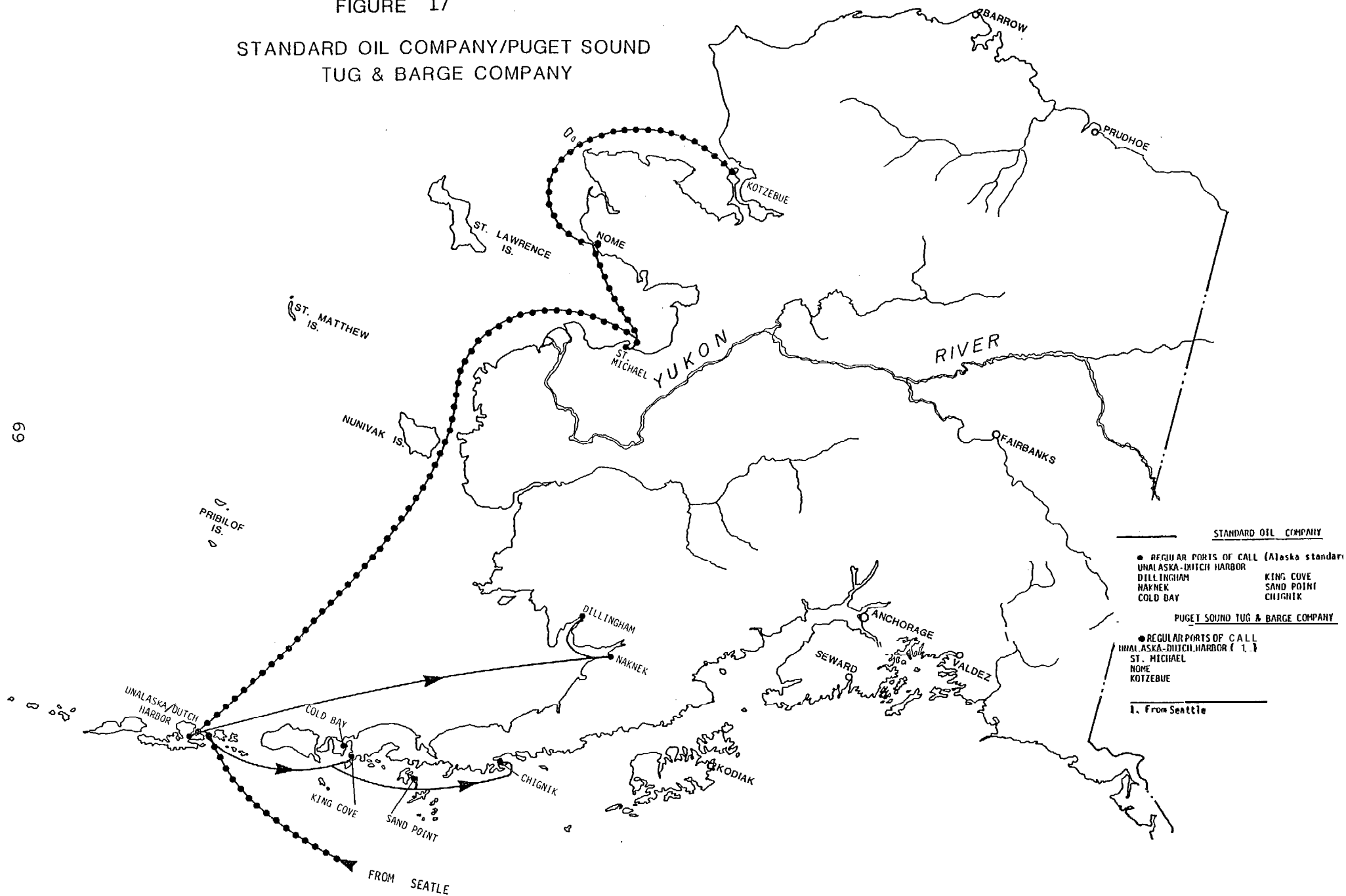
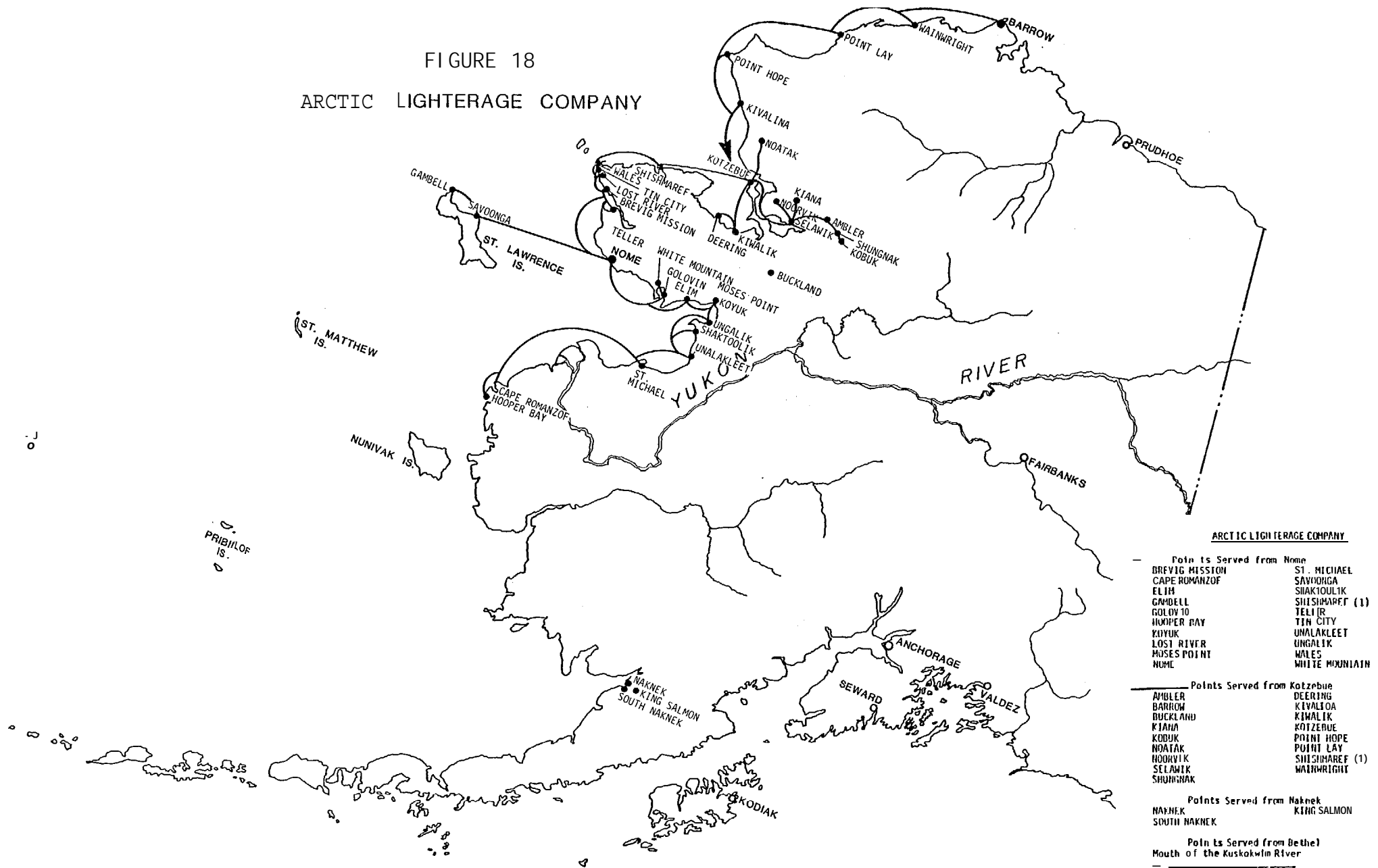


FIGURE 18  
ARCTIC LIGHTERAGE COMPANY



ARCTIC LIGHTERAGE COMPANY

Points Served from Nome  
BREVIG MISSION  
CAPE ROMANZOF  
ELIM  
GAMBELL  
GOLOV TO  
HOOPER BAY  
KOYUK  
LOST RIVER  
MOSES POINT  
NOME  
ST. MICHAEL  
SAVOONGA  
SHISHMARF (1)  
TIN CITY  
UNALAKLEET  
UNGALIK  
WALE  
WHITE MOUNTAIN

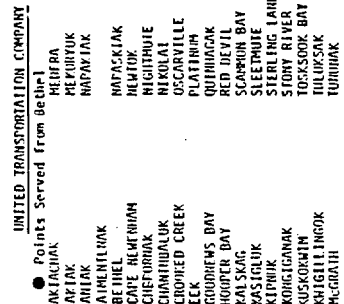
Points Served from Kotzebue  
AMBLER  
BARROW  
BUCKLAND  
KIANA  
KOBUK  
NOATAK  
NOORVIK  
SELAWIK  
SHUNGNAK  
DEERING  
KIVALINA  
KIVALIK  
KOTZEBUE  
POINT HOPE  
POINT LAY  
SHISHMARF (1)  
WAINWRIGHT

Points Served from Naknek  
NARNEK  
SOUTH NARNEK  
KING SALMON

Points Served from Bethel  
Mouth of the Kuskokwim River

1. Shishmaref is served from both  
Nome and Kotzebue.

UNITED TRANSPORTATION COMPANY



Black Navigation Company. Black Navigation Company in St. Michael serves coastal ports from Hooper Bay on the Bering Sea to Elim on Norton Sound and communities on the Lower Yukon (Figure 20). Black Navigation Company primarily ships fuel, but also moves general cargo.

### Other Carriers

A number of contract carriers provide bulk fuel and general cargo service in the Bristol Bay area and at various places along the Bering Sea. These include Sorenson's Barge Service, Moody's Sea Lighterage, Foss Launch and Tug Company, Wick Construction Company, Marine Leasing, Dunlop Towing, and other smaller companies.<sup>a</sup> Representative of these carriers is Foss Launch and Tug which makes constant deliveries of bulk fuel on a contractual, as-needed basis during the ice-free season from Dutch Harbor to any community in the study area. In addition to moving fuel, Foss Launch and Tug supplies the petroleum industry with a variety of materials. At present, petroleum industry shipments occur once a month during the ice-free season.

In addition to these carriers, the Alaska Marine Highway System also serves points within the study area. Four trips a year during the summer are made to Chignik, Sand Point, King Cove, Cold Bay, and for the first time in 1982, Dutch Harbor. The Marine Highway carries passengers and vehicles almost exclusively; of the vehicles transported, most are trucks, construction and other such vehicles. Its impact in terms of freight movements is relatively minor.

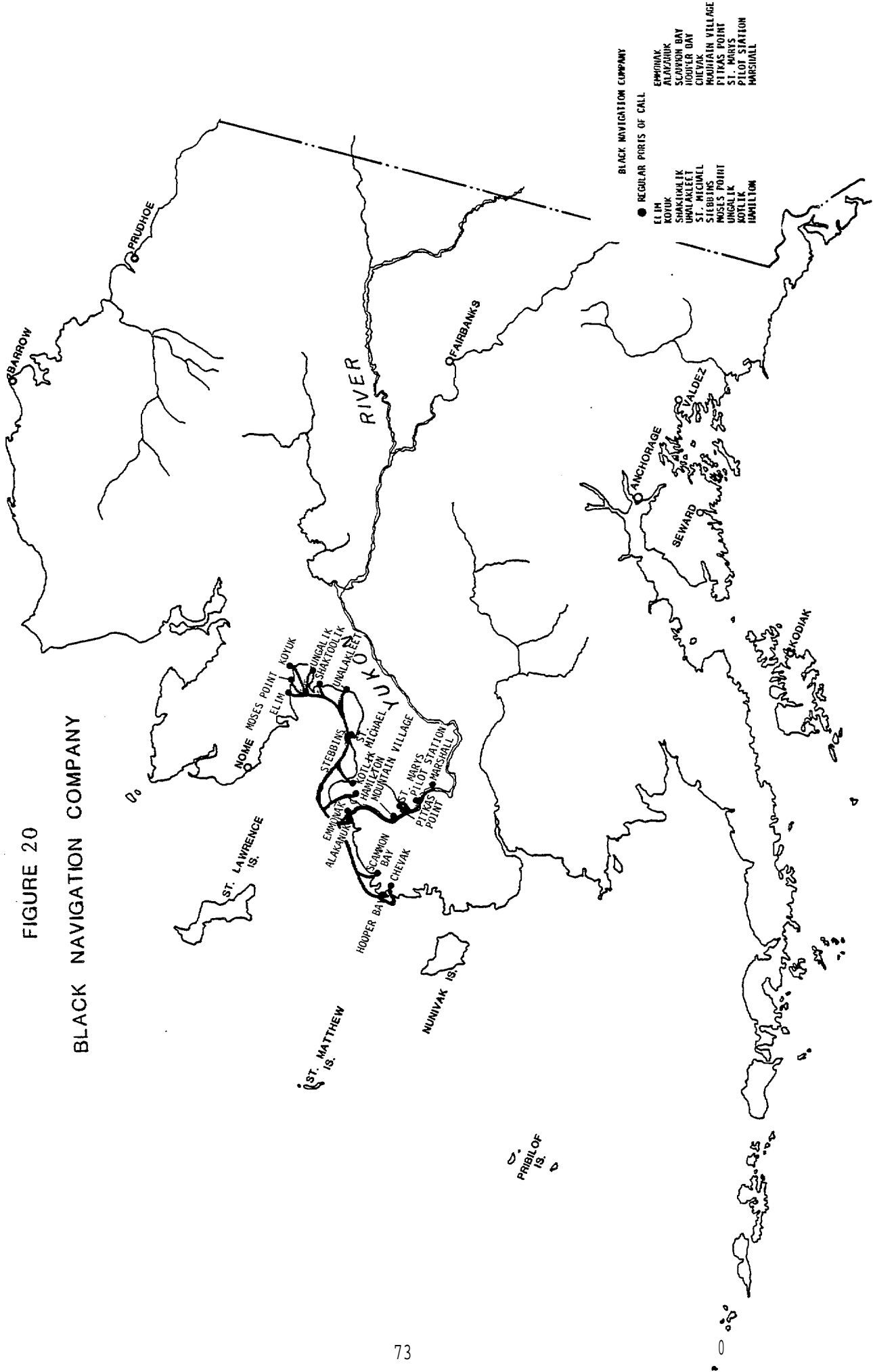
Table 12 summarizes marine carrier operations which occur in the study area.

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<sup>a</sup>Technical Report Number 58, Alaska OCS Socioeconomic Studies Program St. George Basin Petroleum Development Scenarios Transportation Systems Analysis, 1980.

FIGURE 20

BLACK NAVIGATION COMPANY



SUMMARY OF MARINE CARRIER OPERATORS

<u>OPERATOR</u> <u>CARRIERS</u>	<u>TYPE OF SERVICE</u>	<u>CARGO TYPES</u> <u>TRANSPORTED</u>	<u>REGULAR PORT OF CALL</u>	<u>FREQUENCY</u> <u>OF SERVICE</u>	<u>REGULATORY</u> <u>AGENCIES</u>
Western Pioneer	Converted Na vy Yard oilers Scheduled common carrier	General cargo	Chignik, Sand Point, King Cove, False Pass, Cold Bay, Unalaska-Dutch Harbor, Port Moller, Akutan, Pribilof Islands, Clarks Point, Naknek and Dillingham.	Every 6 days (summer) 1 every two weeks (winter)	FMC
Aleut Alaska Shipping company	Ocean going tug and barge Scheduled common carrier	General cargo	Unalaska-Dutch Harbor Chignik, Sand Point, Squaw Harbor, King cove, Cold Bay, False Pass, Ekutan Herendeen Bay, Port Heiden, Egigik, Naknek, Clarks Point and Togiak St. George and St. Paul	22-24 times Per year 11-12 times per year  4-6 times per year	FMC
Northland Services, Inc.	Ocean going tug and barge Scheduled common carrier	Container/ general cargo	Unalaska-Dutch Harbor, Dillingham, Bethel, Emmonak, St. Michaels, Unalakleet, Mt. Village, St. Mary's, Noms and Kotzebue.	4-6 times per year, summer season	FMC
Seal and	Ocean going tug and barge Common carrier scheduled feeder service	Container/ general cargo	Chignik, King Cove, Sand Point Squaw Harbor, Unalaska-Dutch Harbor	Every 8-10 days	FMC
American President Lines	Deep draft container vessels, scheduled export service	Container/ general cargo	Unalaska-Dutch Harbor	1 per week	FMC
Foss Alaska Lines	Ocean going tug and barge, common carrier scheduled feeder service	Container/ general cargo	Adak, Akutan, Unalaska-Dutch Harbor, Oil Dillingham, Bethel, Naknek and Nome.	Every 3 weeks 3-4 times per year, ice- freeze season	FMC
North Star 111	Victory class freighter Scheduled "mil k-run" service	General cargo/ breakbulk, con- tainer, liquid bulk and reefer	BIA and other Government facilities small communities in western Alaska and Aleutian Chain	1 time per year	FMC
Pacific Alaska Lines (Crowley Maritime)	Ocean going tug and barge, common carrier scheduled	Containers, gen- eral cargo, liq- uid bulk	Point Hope, Point Lay, Wainwright, Barrow and Kaktovik. St. Michael, Unalakleet, Kotzebue. Yukon River, Emmonak, Alakamuk, Kotlik, Mt. Village and St. Mary's.	1 time per year during ice- free season 2 times per year during ice- free season	FMC
Cool Barge (APUTCO) (Crowley Maritime)	Ocean going tug and barge, "mil k-run" con- tract carrier service	General cargo liquid bulk	Military installations, all of western Alaska	1 times per year during ice- free season	FMC
Standard Oil Company	Tanker, contract carrier service	Liquid bulk	Unalaska-Dutch Harbor, Oil Dillingham, Naknek, Cold Bay, King Cove, Sand Point and Chignik,	As needed	FMC
Puget Sound Tug and Barge Company	Tug and barge, Scheduled and contract carrier ser- vice	Liquid bulk general cargo	Unalaska-Dutch Harbor St. Michael, Nome and Kotzebue	As needed during ice- free season	FMC
<u>LIGHTERAGE</u>					
Arctic Lighterage (Crowley Maritime)	Coastal and inland river tug and barge and light- erage	General cargo, liquid bulk	Norton Sound, Kobuk River, Kotzebue Sound, and Arctic Ocean	Irregularly/as needed during ice-free season	FMC, ICC
United Transportation Inc. (Crowley Mari- time)	Coastal and inland river tug and barge and light- erage	General cargo liquid bulk	Kuskokwim Bay, St. Lawrence Island, and Kuskokwim River	Irregularly/as needed during ice-free season	FMC, ICC
Black Navigation	Coastal and inland river tug and barge and light- erage	General cargo liquid bulk	Bering Sea, Norton Sound, Lower Yukon River	Irregularly/as needed during ice-free season	FMC, ICC
Other Carriers	Contract carriers/tug and barge and lightering	Liquid bulk, container, break- bulk and special cargoes	All locations	As needed	FMC, ICC
Foreign Vessels	Export	Fish	Bristol Bay	During fishing season	FMC, ICC

Notes: FMC (Federal Maritime Commission)  
ICC (Interstate Commerce Commission)

Source: Louis Berger & Associates, Inc.

## Marine Cargo Insurance

Insurance for marine cargo carried in the study area is included in the tariff rates of most carriers. Cargo is insured against physical loss or damage to the amount of the invoiced or released value at the shipping point. For merchandise valued in excess of usual cargo values, the owner must declare the excess value in the Bill of Landing. This excess value, at times not covered by the carriers, requires underwriting by a marine insurance broker.

Carriers which do not offer insurance as a part of tariff charges require shippers to insure cargo with independent agents. Independent agents determine rates based on a number of factors including:

- 1) season of shipment (summer, winter),
- 2) shipper on which cargo is moving,
- 3) configuration of shipment (i.e., whether on a single or tandem tow) and type of vessel (i.e., oceangoing barge, etc.),
- 4) packing and handling (i.e., whether lightered or not),
- 5) type of commodity and value of cargo,
- 6) location to which cargo moves.

Cargo is usually insured as a percent of cargo value or as a charge per \$100 of cargo value. Although rates are subject to considerable differences depending upon the insurer and the conditions listed above, order of magnitude insurance costs are available for selected locations. These are presented in Table 13.

## Fleet and Equipment

Both interstate and intrastate marine carriers use a variety of vessel types and equipment to serve the study area. A description of the fleet and equipment of each category of carrier is made for each operator.

Western Pioneer. Western Pioneer's fleet consists of four former navy-yard oilers converted to serve the requirements of the fishery industry. All vessels are under 500 gross tons and

TABLE 13

ORDER OF MAGNITUDE INSURANCE RATES FOR SELECTEDLOCATIONS AND Commodities

(Expressed in \$ per 100 of commodity value)

LOCATION:From Seattle  
To:TARIFF RATES BY COMMODITY

	<u>BREAKBULK</u>	<u>CONTAINER</u>	<u>MOTOR VEHICLE</u>	<u>BULK LIQUID<sup>b</sup></u>
Anchorage	\$1.50	\$1.25	\$2.00	<b>\$2.25</b>
<b>Unalaska</b>	2.00	1.75	2.50	2.75
St. Paul	2.50	2.25	3.00	3.25
Cold Bay	2.50	2.25	<b>3.00</b>	<b>3.25</b>
Nome	2.50	2.25	<b>3.00</b>	<b>3.25</b>
Kotzebue	2.50	2.25	3.00	3.25
Barrow	3.00	2.75	3.50	3.75

<sup>a</sup>Based on single tow, ocean going barge during the summer season.<sup>b</sup>Bulk liquid under certain conditions is not insurable.

Source: Interviews with Seattle marine insurance brokers and agents.

have a total capacity of over 4,100 cubic meters (145,000 cubic feet) of refrigerated cargo space. Western Pioneer plans to add another vessel to its fleet which will have an additional capacity of 1,133 cubic meters (40,000 cubic feet). Loading and unloading equipment consists of class 4,000 cranes having a 2,730 kilogram (6,000 pound) capacity augmented by standby gear having a 4,550 kilogram (10,000 pounds) capacity and heavy duty forklifts.

**Aleut Alaska Shipping Company.** The Aleut Alaska Shipping Company operates three freighters all of which are slightly under 500 gross registered tons. The Snowbird, owned by Aleut Alaska's affiliate, Alaska Marine Charters, Inc., and the Aleut Parker, owned by the subsidiary Cape Saraches Corporation, have respective capacities of 620 and 790 cubic meters (22,000 and 28,000 cubic feet), all of which is refrigerated. Another vessel, the Aleut Provider, which in the past was operated by the Aleut Alaska Shipping Company, was converted to a processor. Handling equipment for both vessels consists of heavy duty forklifts and cranes.

**Northland Services.** Northland Services generally assigns two ocean-going tugs to the study area: the Polar Star, which is 35 meters (115 feet), a 1500 hp. tug, and the Taurus, a 27 meter (89 feet) 2400 tug. Barges assigned to the area include the Polar Trader, 85 meters (279 feet), 1761 berth gross tonnage; the Tazlina, 83 meters (272 feet), 2922 berth gross tons; the ZBO-280, 83 meters (276 feet), 3106 berth gross tons; and the ML-3283, 54 meters (282 feet), 3422 berth gross tons. In addition, Northland Services also supplies a small barge to canneries in the study area. This barge, the ZBO-204, is 54 meters (176 feet) and 646 berth gross tons.

Northland Services carries heavy-duty forklifts and class 4000 cranes on board ship for handling and discharging of cargo.

**Sea Land.** Sea Land's feeder vessel, the Aleutian Developer is 105 meters (345 feet) long, 24 meters (80 feet) wide and has a 5.8 meter (19 foot) draft. It has a carrying capacity of 83 containerized vans and is equipped with its own crawler crane for loading and unloading. Due to its size, the Aleutian Developer requires a dock with a minimum 61 meters (200 feet) berth in order to offload containers. Communities which lack this facility cannot be served by Sealand.

American President Lines. APL four pacesetter class container ships within the study area at Unalaska-Dutch Harbor. These ships are approximately 203 meters (669 feet) in length, 27 meters (90 feet) in width and have drafts of 10 meters (33 feet). They have a capacity of 21,090 metric tons (23,200 short tons), or 1,482 twenty-foot equivalent units (TEU).<sup>a</sup> APL also operates C-5 class breakbulk vessels at Unalaska-Dutch Harbor. Typical dimensions of these vessels are 184 meters (605 feet) by 25 meters (82 feet) with a draft of 10.7 meters (35 feet). Vessel capacity is 31,820 metric tons (35,000 short tons).

Handling equipment used by APL includes the container lifting gantry crane at Dutch Harbor. APL also owns and operates the 79 meter (260 foot docking facility at Unalaska-Dutch Harbor.

Foss Alaska Lines. Foss Alaska Lines utilizes a variety of deep-draft, ocean going tug and barge combinations depending upon its shipping requirements. A typical line haul barge has a gross registered tonnage (GRT) of over 2,000 tons and dimensions of 73 by 18 meters (240 by 60 feet) with a draft of 3.7 meters (12 feet) .

Foss Alaska Lines uses large cranes and 30 to 40 ton forklifts for loading and unloading barges. In Dutch Harbor it uses APL'S 79 meter (260 foot) wharf and gantry crane designed for rapid loading and unloading of containers.

Foss also carries containers for automobiles and small trucks, platform containers designed for handling cargoes such as machinery, lumber, pipe, and other non-containerized cargo.

North Star III. The BIA North Star III is a victory-class vessel built in 1945. It is 139 meters (455 feet) long, with a draft of 8.7 meters (28.5 feet) and deadweight tonnage of 10,206 long tons. The vessel has a capacity of 11,900 cubic meters (420,000 cubic feet) of dry cargo and can carry an additional 3,219 kiloliters (850,000 gallons) of petroleum. The 5,850 hp. diesel power plant allows for a cruising speed of 16 knots.

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<sup>a</sup>A twenty-foot equivalent unit (TEU) equals a container van of 2.4 by 2.6 by 6.1 meters (8 by 8.5 by 20 feet).

The North Star III has its own handling facilities (cranes) and carries four LCM landing craft for lightening cargo.

Crowley Maritime. In addition to the vessels and equipment indicated in Pacific Alaska Lines, Cool Barge, and Crowley's lighterage services, Crowley Maritime is putting into operation four 9000 hp. tugs for service to the oil companies on the North Slope and elsewhere. These tugs will be equipped with special equipment for cargo handling.

PAL operates two 4,200 horsepower tugs and two 122 by 23 meter (400 by 76-feet), 9,100 dead weight ton (DWT) container barges. A 61 meter (200-feet) barge of 2,750 DWT accompanies the larger barge on some shipments, usually the first run of the season. The larger barges have a cargo capacity of 10,900 metric tons (12,000 short tons).

Handling equipment, like other ocean-going barge operations consists of cranes and heavy duty forklifts. During the first run of the season, PAL also employs the ice-breaking barge, the Arctic Challenger, a 4,717 DWT barge with a (310 foot) length, a width of (105 feet) and a (16.8 feet) draft, to negotiate the ice normally encountered during that time.

Crowley's "cool barge" operation employs three barges, each approximately 91 by 23 meters (300 by 76 feet) with 4.9 meter (16 foot) drafts. One of these barges carries bulk petroleum products exclusively, the other two are combination barges carrying general cargo as well as bulk petroleum products. The liquid bulk capacity of the combination barges is 100,000 barrels. Tugs used for this operation vary from year to year as they are rotated between other Crowley operations. A typical tug employed in this service is the 3000 hp. Blackhawk which measures 37 by 10.4 meters (122 by 34 feet) with a draft of 4.3 meters (14 feet). Handling equipment includes cranes and forklifts.

Standard Oil Company Chevron. The Alaska Standard is the only vessel operated in the study area by Standard Oil. This tanker is registered at 35,000 DWT, and delivers fuel directly to dock face. Consequently, loading equipment consists of pumps.

Puget Sound Tug and Barge Company. Puget Sound Tug and Barge Company employs a large number of tugs and barges of varying sizes in the study area. As a contract carrier, the vessels and equipment employed will vary from contract to contract.

#### Intrastate Coastal Shippers, Coastal Lighterage and Rivering operations

Coastal shippers and lighterage services, both common and contract carriers, use shallow draft vessels due to the limited water depths along the coast and in most river channels. Tug S used range from 220 horsepower with a .8 meter (2.5 foot) draft to approximately 1000 horsepower with a 1.1 to 1.2 meter (3.5 to 4 foot) draft. Depending upon the size of tug in operation, barges run from 18 by 6 meters (60 by 20 feet) carrying around 100 tons of cargo to line haul barges of 44 by 23 meters (145 by 75 feet) with a capacity of 1000 tons or more. Drafts of barges are varied by loading density. Many of the barges are liquid cargo barges with a flat deck used for loading dry cargo.

Handling equipment aboard these tug and barge combinations varies considerably. Some carry no handling equipment and rely on handling equipment available at the point of destination. Other tug and barges have a variety of diesel, electric, and steam pumps, hydraulic winches, bow ramp forklifts, and other devices.

#### TARIFFS

Marine carrier tariffs are a function of a number of characteristics of demand for given commodities and locations. Consequently, tariffs between carriers vary significantly and are greatly affected by the type of commodity transported, the distance it is transported, its quantity, and other factors including relationships between various traffic movements and the degree of competition. Because of these considerations, a direct comparison of commodity rates and services on a carrier by carrier basis is not possible. However, tariff rates for key commodities can be identified and grouped by carrier type. Tariff schedules for each carrier are filed with the appropriate regulatory agency, either the ICC or the FMC.

## Interstate Carrier Tariffs

Scheduled interstate carrier tariffs are generally presented as point-to-point rates by **class**<sup>a</sup> and commodity to regular points of call, or ports where direct shipments are provided. Rates usually include loading and unloading cargo at the **port-of-call** or dock, but these are sometimes **linehaul** rates to the ships' anchorage combined with rates associated with lighterage charges. Tariffs to points served on an irregular basis are based on the point-to-point rates to the next furthest regulating scheduled port-of-call. Loading and unloading of **cargo at** irregular points, when performed by a tug and barge line, is charged an additional incremental rate by all carriers. Irregular points which are served by connecting carriers such as Arctic Lighterage and United Transportation, Inc., publish **point-to-point** tariffs separately with the FMC. These are discussed below. Charges associated with handling, storage, consolidation or special handling or shipping are additional.

## North Star 111 Tariffs

One of the exceptions to the pattern of interstate tariffs is the tariff structure of the North Star III. As a BIA operated general cargo ship having its own lighterage capacity and serving a number of communities as well as BIA facilities, on a once a year basis, tariff structures reflect its unique operations.

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<sup>a</sup>**Class** rates are defined by the ratio of weight to volume of any item. This group of different commodities with similar **weight-to-volume** characteristics constitutes a given class.

<sup>b</sup>**Commodity** rates relate to a specific commodity such as bulk petroleum, building materials, and fish, and are **quoted in** cents per 100 pounds. Commodity rates will vary depending upon commodity type, shipment size, volume, and weight.

Historically, the North Star III was intended to resupply BIA facilities in Alaska where adequate cargo services were not otherwise provided. In addition to supplying BIA facilities, the ship also provides service to private individuals on a space available basis. This service is granted only to areas deemed by BIA to be not otherwise adequately served and is granted on a first-come-first-served basis. To qualify for this service, individuals must apply for a permit.

North Star III tariffs reflect this phenomena. One rate applies to government shippers and the other to permit shippers. Tariffs are based on revenue requirements needed to meet operating costs excluding insurance, reserve funds, and any return on investment but do not allow for profit.

The North Star tariff contains four basic rates: the point-to-point by commodity rate, the point-to-point bulk or oil rate, the terminal and handling rate and the lighterage and longshoring rate. The point-to-point by commodity rate is a two-part tariff on all commodities except bulk oil. One part applies to government shippers, the other to permit holders. This rate is determined by the zone or geographic region to which a particular commodity is shipped. There are six regions identified on Table 14. Tariffs shown in Table 15 for this rate are expressed per 100 pounds within specific weight charges.<sup>a</sup>

The point-to-point bulk oil rate applies to bulk oil and is in dollars per gallon by destination. An additional charge to this basic rate is made when bulk oil is delivered to storage containers in amounts less than 500 gallons and when oil is loaded at an Alaska port and delivered to any destination.

The terminal and handling tariff rate applies when cargo is handled at the BIA terminal in Seattle but is not shipped on the North Star III. This charge effectively applies when a shipper elects to use an alternative carrier.

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<sup>a</sup>Louis Berger & Associates, Inc. Western and Arctic Alaska Transportation Study, 1980.

TABLE 14

NORTH STAR III SHIPPING REGIONS IN STUDY AREA

<u>A</u>	<u>B</u>	<u>C**</u>	<u>D</u>	<u>E</u>	<u>F*</u>
Akutan	Brevig Mission	Buckland	Barrow	Chevak	Alakanuk
Anchorage Bay	Chefornak	Kiana	Deering	Koyuk	Emmonak
Atka	Diomedes	Kotzebue	Kivalina	Newtok	Kotlik
Belkofski	Elim	Noatak	Point Lay	Nightmute	Mt. Village
Chernofski	Gambell	Noorvik	Point Hope	Scammon Bay	Pilot Station
Chignik Lake	Golovin	Selawik	Wainwright	White Mountain	St. Mary's
Chignik Lagoon	Goodnews Bay	Shungnak			St. Michael
Ivanoff Bay	Hooper Bay				Sheldon Point
Larsen Bay	Mekoryuk				
Nelson Lagoon	Nome				
Nikolski	Platinum				
Togiak	Savoogna	*Ships anchorage at			**Ships anchorage at
Twin Hills	Shaktoolik	St. Michael			Kotzebue
Umnak	Shishmaref				
Unalaska	Stebbins				
	Tin City				
	Toksook Bay				
	Tununak				
	Unalakleet				
	Wales				

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A - Togiak and all points south thereof

B - All points north of Togiak but not north of Shishmaref

C - All points served from ship's anchorage at Kotzebue

D - All points north of Kotzebue Sound excluding Deering

E - All points requiring long lighterage time

F - All points served from ship's anchorage at St. Michael

Source: Bureau of Indian Affairs.

TABLE 15

NORTH STAR 111 SELECTED COMMODITY RATES

(\$ PER 100 POUNDS)

	<u>REGIONS</u>					
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>
Motor vehicles	41.20	43.15	<b>43.15</b>	46.40	43.80	41.20
Cement, sand & gravel	11.50	11.88	10.32	13.94	<b>12.69</b>	9.50
<b>Canned</b> fish	11.76	<b>12.30</b>	10.20	12.66	13.08	10.08
Groceries	14.95	15.40	14.30	16.95	16.00	13.45
<b>Oil</b> (drum) <sup>a</sup>	15.45	15.95	14.35	<b>17.30</b>	16.60	<b>14.00</b>
Appliances	45.60	46.90	46.90	46.40	43.80	41.20

<sup>a</sup> Less than 32,000 pounds.

Source: Bureau of Indian Affairs, North Star 111, 1982, Tariff.

● The lighterage and longshoring rate applies to cargo handling services provided from the North Star III's anchorage to the destination at a specific community. As this service is performed by a private company, the rates are determined on a contractual basis by the respective lighterage company serving various communities and the North Star III. These rates are expressed as a fee per revenue ton for all commodities except bulk oil.

● Other Tariffs

Other tariffs include those of intrastate coastal and barge lighterage tariffs and are made on a contract basis. Tug and barge and lighterage tariffs are published and available at the ● ICC and FMC. Like interstate carrier tariffs, they are generally presented as point-to-point rates by class and commodity and are a function of distance, type and amount of commodity transported, loading and unloading characteristics, and competitive considerations. Lighterage tariffs are generally incorporated ● into the linehaul commodity rates from Seattle. Tariffs are quoted primarily in dollars per 100 pounds. Selected commodity tariffs presented in Table 16 indicate relative lightening costs. Table 17 presents selected interstate tariffs.

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TABLE 16

1979 LIGHTERAGE TARIFFS FOR SELECTED COMMODITIES

(PER 100 POUNDS)

<u>COMMODITY</u>	<u>KOTZEBUE</u>	<u>NOME</u>	<u>ST. MICHAEL</u>
Vehicles	<b>10.00</b>	9.20	4.62
Cement	2.60	2.50	<b>1.09</b>
Canned Fish (Outbound)	5.20	5.00	1.00
Groceries	2.50	2.40	1.50
Household Appliances	5.00	4.86	2.52
Petroleum, Bulk	2.30	2.20	1.48
Other Freight (not otherwise specified)	8.30	8.00	<b>1.35</b>

NOTE: Ships anchorage to shore distance: Kotzebue 13.5 miles, Nome 1.0 miles and St. Michaels 12.0 miles.

Source: Louis Berger & Associates, Inc., Western and Arctic Alaska Transportation Study, 1980.

TABLE 17

SELECTED INTRASTATE TARIFFS

(\$ PER 100 POUNDS)

<u>COMMODITY</u>	<u>BETHEL - EEK<sup>a</sup></u>	<u>NOME - GOLOVIN<sup>a</sup></u>	<u>KOTZEBUE - DEERING<sup>a</sup></u>
Machinery	3.48	16.97	17.31
Petroleum (drum )	2.61	16.45	16.84
Petroleum (bulk)	.19 <sup>b</sup>	.44 <sup>b</sup>	.57 <sup>b</sup>

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<sup>a</sup>Distances are between 65 and 85 miles.

<sup>b</sup>In cents per gallon, less than 5,000 gallons.

Source: Arctic Lighterage Company, Freight Tariff ICC 3002-A, " Effective August 4, 1982, United Transportation, Inc., Freight Tariff No. 301, Effective June 10, 1979.

## Aviation Transportation System

### AVIATION INFRASTRUCTURE AND TRAFFIC DATA

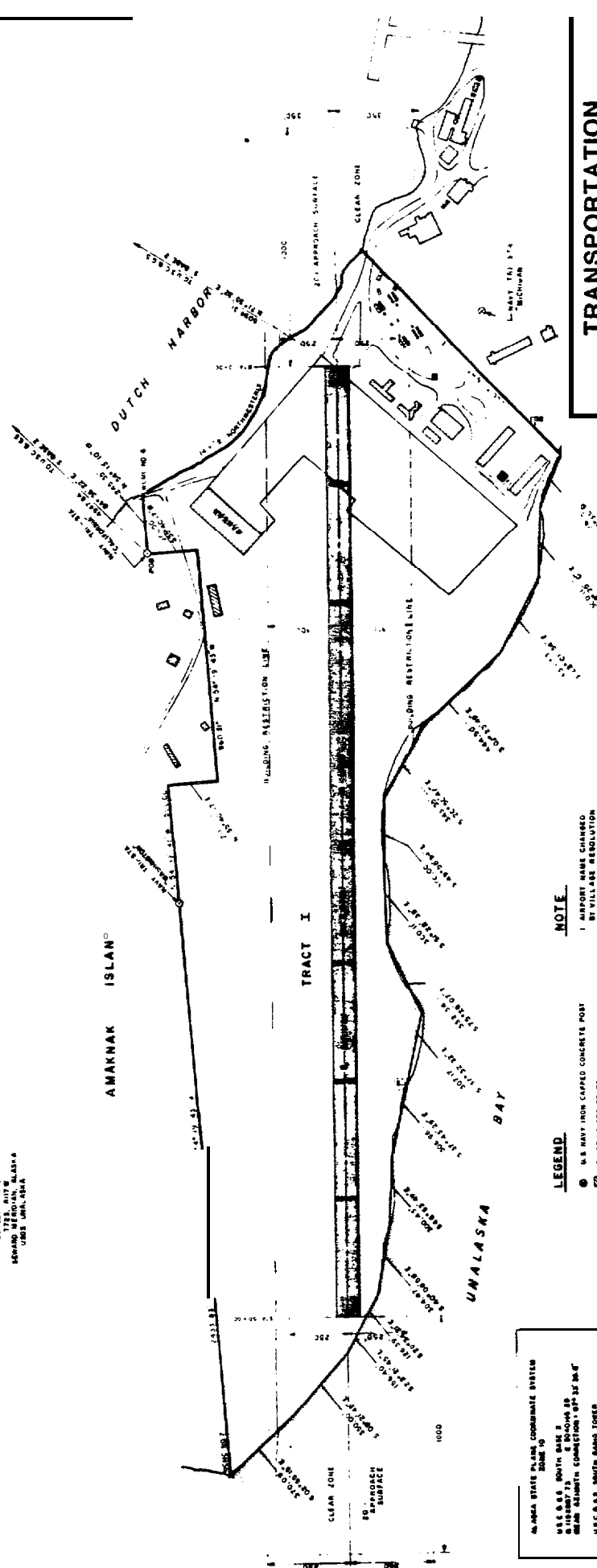
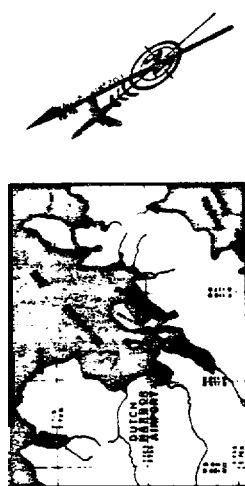
#### Unalaska-Dutch Harbor

Unalaska-Dutch Harbor, with a population of 2,300, is the largest community in the region. It is one of the busiest fishing ports in the United States, as well as Alaska. Although Unalaska is the demographic and economic center as well as the maritime center of the Aleutian/Alaska Peninsula region its airport is considered a "regional airport" rather than the regional center for the area. According to the Alaska Aviation System plan categorization (TRA/FARR and Louis Berger & Associates, Inc., 1982), it is second to Cold Bay in terms of air traffic throughput. The airport is owned by the Alaska DOT/PF. In 1982, only one airplane was based there.

The airport is 1.6 kilometers (one mile) north of the town of Unalaska. It is 675 kilometers (420 statute miles, 365 nautical miles) from the nearest point of the Navarin lease sale area and 1,158 kilometers (720 statute miles; 626 nautical miles) from the farthest point.

Runways, Taxiways, Aprons. The runway consists of a single strip with an FAA certified length of 1,190 meters (3,900 feet), reduced from an earlier certified length of 4,300 feet. Certified runway width is 100 feet, but in some graded areas it runs up to 200 feet wide. The runway orientation of 120° to 300° is dictated by geographic constraints and lack of space. There are no overrun or safety areas at either end of the runway where the ground drops off to seawater. Nearly 1,070 meters (3,500 feet) of the runway-, is surfaced with fractured rock. Some 525 feet cuts across a paved apron. Figure 21 shows the Unalaska-Dutch Harbor airport configuration.

There is no designated taxiway which reduces the theoretical runway capacity. There is a paved ramp/turnaround area at the south end of the runway. Bisected by the runway, the area is thus effectively divided into two aprons. An amphibious aircraft ramp is located at the southeast end of the runway.



**LEGEND**

1 U.S. NAVY INCON CAPPLED CONCRETE POST  
2 EXISTING STRUCTURE  
3 40A 5/8" REBAR WITH ALUMINUM CAP

INFORMATION BASED ON DIVISION OF  
AVIATION OUTCH HARBOR SURVEY  
CONTROL SHEET, 5/6/75

[illegible]

# TRANSPORTATION IMPACT ANALYSIS NAVARIN BASIN

UNALASKA -- DUTCH HARBOR  
AIRPORT

FIGURE 2

Communications. Dutch Harbor is an untowered, "unattended" or "uncontrolled" airport/sea dome. There are radio links on local channels to the Anchorage Flight Service Station (FSS) to provide assistance to aircraft on instrument approaches or departures. Ground flight service is provided by telephone by the Cold Bay FSS.

Nav aids. Unalaska has a Non-Direction Beacon (NDB) and Distance Measuring Equipment (DME). Aircraft with Automatic Direction Finder (ADF) units can get a directional bearing on the NDB with their ADF's. DME's indicate the linear distance an aircraft is from a given point. There is no radar. There are neither an Instrument Landing System (ILS) to provide vertical guidance nor markers; indeed, the areas where markers would be located are seawater. Thus, the standard instrument approach is classified as "non-precision."

Lighting. There is not at present a system of lights along the runway or down the runway center; however, there are "runway end identification lights" (REIL) at each end of the runway. The light systems may be activated by airborne pilots "keying" their radio microphones. There is a lead-in light indicator (LDIN) at the northwest end of the runway and Visual Approach Slope Indicators (VASI) which show pilots on short final approach whether they are too high or too low. The airport is considered to have a partial lighting system.

Operating Considerations and Constraints. Several operational problems associated with Unalaska Airport result from the local geography. Unalaska is not an easy airport to fly into or out of. The published Instrument Approach procedure (IAP) warns of "mountainous terrain on all quadrants," and that the runway and radio navigation beacon are located at the base of a 498 meter (1,634 foot) mountain. Aviators are further warned of possible severe wind turbulence off the mountain and of unmarked obstacles close to the runway. In short, a pilot is flying in among mountains higher than the standard 305 or 457 meter (1,000 or 1,500 foot) traffic altitudes, and normal airport traffic patterns are impossible as circling aircraft using standard patterns would collide with the mountains.

These operational problems are compounded when aircraft must use instruments to assist their landing approach. The IAP warns that the "extended approach course passes within 0.5 Nautical

Miles from (the mountain) peak". Instrument equipped aircraft that do not find the weather sufficiently clear at the "point of decision" and therefore cannot land are cautioned that "any go around commenced after passing (the) published missed approach point will not provide standard obstruction clearance." That is, if airplanes approaching in at 213 meters (700 feet) do not establish sufficient visibility and ceiling 10 miles out from the airport, the standard maneuver usually implemented, i.e., to go around and try again will lead a pilot perilously close to mountains. The instrument approach altitude is low; if pilots cannot get a local atmospheric pressure reading to adjust their altimeter, instrument approaches are not authorized. The approach is not authorized at night.

Once on the ground, there are more operational difficulties. The runway is too short for commercial jets or fully loaded large turbine aircraft. With seawater at each end of the runway, there is no over-run area or threshold, and no room for error. The terminal building is located close enough to the runway, 76 meters (250 feet), to constitute a hazard. There is no taxiway, and for this reason, aircraft landing from the southeast must turn around without benefit of an apron and taxi down the length of the active runway to clear the runway for the next aircraft.

In addition to stones which can cause heavy wear on landing gear, tires, and propellers, standing water on the uncrowned runway is an occasional problem and has contributed to accidents in the past.

Service. Scheduled air service to Unalaska has increased substantially in the last several years. Reeve currently provides nine flights per week Monday through Saturday to Cold Bay and Unalaska with YS-11's, a 20 percent increase over 1979. . Reeve also provides direct YS-11 service to Port Heiden enroute to and from Anchorage and Unalaska. Additional scheduled service to Unalaska is provided by AirPac. This carrier initiated Anchorage-Unalaska direct service in 1982 with a Metro and Cessna, but currently operates the service with an F-27. Alaska Airlines markets tickets for AirPac on this route. All other intra and interregional scheduled services, is via Cold Bay.

Traffic Activity. Reeve enplaned over 12,000 revenue passengers at Unalaska in 1980, about six percent more than in 1979 (see Table 18). According to the FAA Terminal Area

TABLE 18

REEVE ALUTIAN AIRWAYS: AIR TRAFFIC AND OPERATIONS AT UNALASKA, 1974-1980REVENUE TRAFFIC

<u>Y EAR</u>	<u>ENPLANED REVENUE TONS</u>					<u>DEPLANED REVENUE TONS"</u>		
	<u>PASSENGERS</u> <u>ENPLANED</u>	<u>DEPLANED</u>	<u>MAIL</u>	<u>FREIGHT</u>	<u>TOTAL</u>	<u>MAIL</u>	<u>FREIGHT</u>	<u>TOTAL</u>
1974	3, 878	----	31. 2	65. 5	96. 7	---	---	---
1975	3, 947	4, 066	38. 0	101. 3	139. 3	129. 9	219. 7	349. 6
<b>1976</b>	5, 711	5, 668	38. 4	116. 3	154. 7	157. 4	386. 3	443. 7
1977	7, 227	6, 544	39. 4	89. 5	128. 9	212. 3	340. 8	553. 1
1978	8, 565	8, 416	40. 4	65. 7	106. 1	304. 7	311. 5	616. 2
1979	11, 666	12, 031	41. 2	68. 1	109. 3	445. 2	413. 6	858. 8
1980	12, 330	12, 002	67. 9	87. 7	<b>155. 6</b>	640. 4	432. 9	1, 073. 3
1981	10, 607	10, 924	75. 2	154. 2	229. 4	754. 1	398. 9	1, 153. 0
Average :								
Annual								
Growth Rate,								
1975-1981	17. 9%	<b>+17. 9%</b>	<b>+12. 0%</b>	<b>+7. 3%</b>	8. 7%	<b>+34. 1%</b>	<b>+8. 0%</b>	<b>+22. 0%</b>

AIRCRAFT OPERATIONS

	<u>SCHEDULED</u>	<u>UNSCHEDULED</u>	<u>TOTAL</u>
1974	316	18	334
1975	359	12	<b>371</b>
1976	391	34	425
1977	380	5	385
1978	405	1	406
<b>1979</b>	518	5	523
1980	583	5	588
1981	---	---	565

Average

Annual

Growth Rate,

1974-1981 +7. 8%

Source: 1981 Statistics and deplanements provided by Reeve Aleutian Airways, Inc. And other statistics.

Forecasts there have generally been less than 500 passengers per year by all other carriers.

Over 150 tons of cargo were enplaned at Unalaska-Dutch Harbor in 1980, nearly 50 tons more than in 1979. Somewhat less than half this amount was mail. In 1980 Reeve's operations neared 600, an increase of nearly 12 percent over 1979.

From 1974 to 1980, passenger traffic at Unalaska grew period at an 18 percent annual rate (see Table 19). The growth of passenger demand between Unalaska and points outside the region largely accounts for the increased passenger throughput at Cold Bay. At the same time, freight grew at a slower, but healthy, 8.3 percent. Mail grew faster than freight, changing the ratio of parcel post to air freight from 1:2 to 9:11.

The FAA Terminal Area Forecast (TAF) data base estimates total traffic at between 1,000 and 2,000 operations annually, with nearly all of it commercial. To accommodate the increase in demand, aircraft operations increased at a 12 percent rate for the period (see Table 19).

### Cold Bay

Cold Bay functions as the regional center airport for the southeastern Alaska Peninsula and the Aleutian Chain. Aircraft arrive from Anchorage and Seattle, providing interregional and interstate air links; from Cold Bay, aircraft serve the surrounding communities including Unalaska and fly out the chain to distant Shemya and Adak. Flying Tiger has in the past used Cold Bay as a stopover refueling point for Boeing 747 cargo jumbo jets-on international flights. The airport is owned by the State DOT/PF. A dozen or more aircraft are based at Cold Bay. Customs service is available.

The airport is adjacent to the small settlement of Cold Bay. It is 772 kilometers (480 statute miles, 417 nautical miles) by air from the nearest point in the Navarin field and 1,142 kilometers (710 statute miles, 617 nautical) miles by air from the farthest point.

TABLE 19

AIR CARRIER TRAFFIC **AND** OPERATIONS STATISTICS  
FOR **UNALASKA** - DUTCH **HARBOR**

	<u>1979</u>	<u>1980</u>	<u>PERCENT CHANGE</u>
<u>Enplaned Passengers</u>			
Schedul ed	11, 566	12, 194	
Non-schedul ed	100	136	
Total	11, 666	12, 330	+6
<u>Enplaned Revenue Tons</u>			
Freight	68. 11	87. 69	
<b>Mail</b>	41. 22	67. 88	
Total	109. 33	155. 57	+42
<u>Operations by Aircraft Type</u>			
<u>Schedul ed</u>			
C-46S	58	--	
<b>YS-11s</b>	460	583	
Total Schedul ed	518	583	+13
<u>Non-Schedul ed</u>			
<b>C-46s</b>	--	--	
<b>YS-11s</b>	5	5	
Total hen-Schedul ed	5	5	
Total Operations	523	588	+12
Departures Schedul ed	401	478	+19
Schedul ed Departures	375	474	
Percentage of Departures Schedul ed	94%	99%	

Source: :CAB Ai rport Acti vi ty Stati stics, Annual

Runways, Taxiways, and Aprons. There are two runways at the, Cold Bay Airport. The main runway runs north-northwest to south-southeast, a 140° to 320° orientation, and is 3,175 meters (10,415 feet) long by 46 meters (150 feet) wide. The long runway is crossed at the southern end by the short runway, which runs east-west with an 80° to 260° orientation. The short runway is 1,562 by 46 meters (5,126 by 150 feet). Both are well paved with asphalt. The layout of the airport is given in Figure 22.

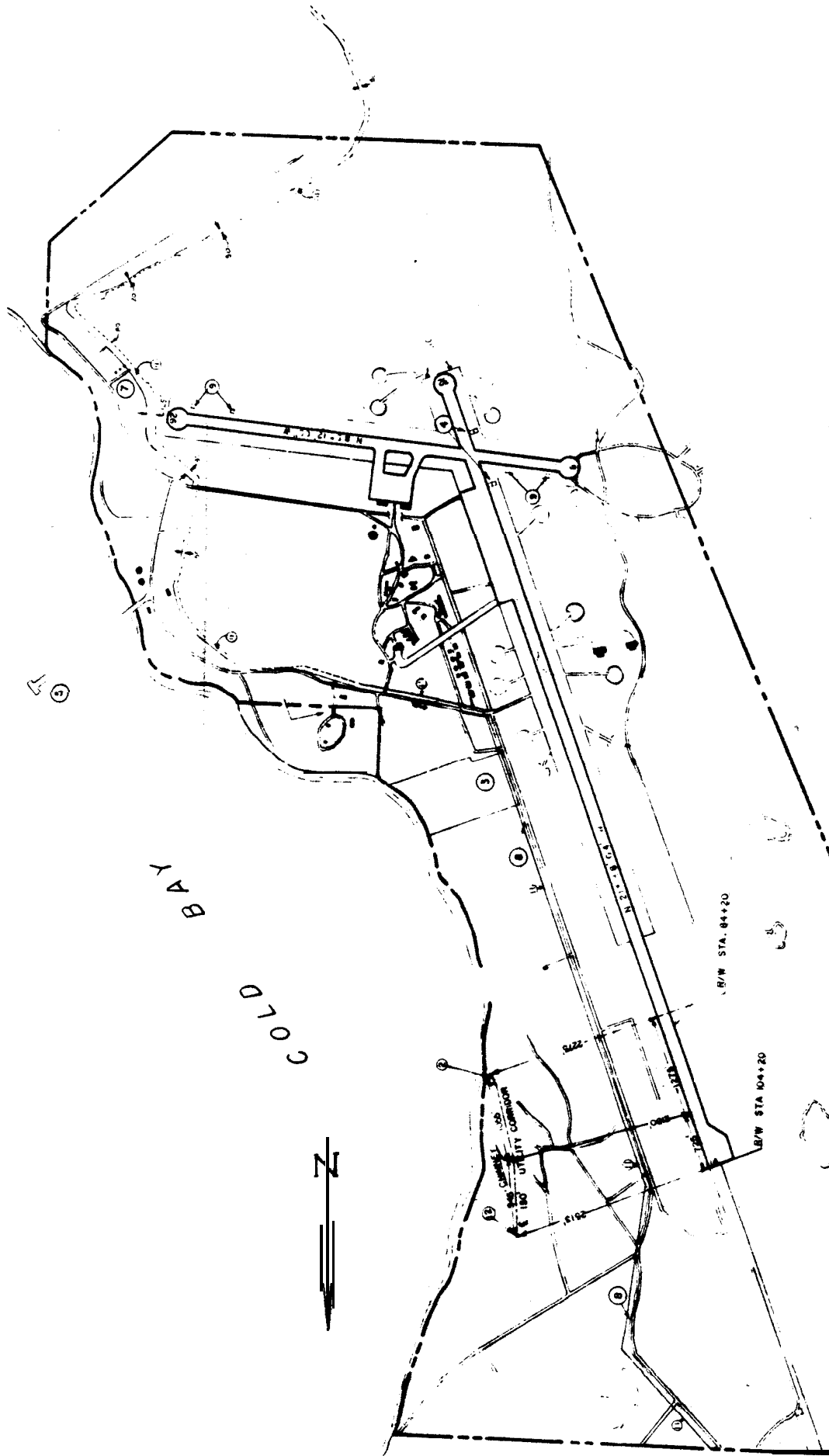
There are taxiways along most of the runway lengths. Unlike the Unalaska airport, there is more than adequate area for turn-around, transit aircraft, and tie-down space at the Cold Bay airport.

Nav aids. Cold Bay has an NDB, a VOR and a DME to provide directional bearings. The VOR/DME is located 3 nautical miles from the airport to the north-northwest. The NDB is located at a distance of 4.8 nautical miles. There is an ILS with glideslope localizer and markers. Thus, the facilities for instrument approaches are considerably better than at other regional airports. Even so, mountains block the VOR directional signals on many points of the compass at low cruising altitudes.

Lighting. Three of the four thresholds have VASI systems to assist aircraft coming in for landing on short final approach. The other has a Simplified Short Approach Light System (SSALS) with RAIL. There are sequenced flashers with the approach lights. Runway 32 is equipped with RAIL lights. All the runways are marked by High Intensity Runway Lights (HIRL). Cold Bay is considered to have a complete lighting system, suitable for night operations.

Communications. Cold Bay is untowered, with no flight controllers; however, there is an FAA FSS to advise pilots and handle flight plans. The military also maintains a radio facility there.

Service. As of the summer of 1982, Reeve provided Cold Bay with six direct non-stop Electra flights per week to and from Anchorage. To matching this service, Reeve has seven YS-11 flights per week between Cold Bay and Unalaska. The flights are timed so that passengers and cargo can be quickly transplanted and flown to either Unalaska or Anchorage.



Reeve also flies YS-11's from Anchorage to Cold Bay six days per week, with two stop-offs along the way. Three times a week, the YS-11 stops at King Salmon and Sand Point; three times per week on alternate days, it stops in Port Heiden and Sand Point.

There is one direct flight per week over to Akutan and another to False Pass by amphibious Grumman Goose. Nikolski and Port Moller also have one non-stop flight per week. These are "scheduled air-taxi" routes served by small aircraft. King Cove has service three times per week by Grumman Goose. Cold Bay is also linked to St. Paul Island and Shemya. Three times per week, Reeve provides direct service to Seattle by Lockheed Electra.

The number of scheduled flights serving Cold Bay increased about 4 percent from 1979 to 1980. Reeve increased service with its YS-11's and Electras, and took its C-46's out of regular service.

Traffic Activity. The main air carrier into Cold Bay is, of course, Reeve. In 1980, Reeve flew 25,000 passengers out of Cold Bay, an 18 percent increase over the previous year (Table 20). According to the FAA TAF data, there were 1,000 to 1,500 air taxi enplanements in 1979. The TAF data indicate that total passenger enplanements more than doubled from 1976 to 1979.

Reeve enplaned about 930 tons of cargo Cold Bay in 1980, an increase of 28 percent over 1979. Over half this amount was mail and parcel post. Reeve's cargo enplanements out of Anchorage, most of which passed through Cold Bay, were nearly 3,200 tons. Typically in Alaska, air cargo flows dispatched to rural areas from main points are generally much greater than cargo shipped from rural areas to Alaskan cities or the Lower 48.

Reeve performed 1,300 aircraft operations at Cold Bay in 1980. About 800 were by YS-11's, while nearly 500 were by the larger Electras (Table 20). According to the FAA TAF, there were about 5,000 aircraft operations at Cold Bay in 1979. Of those not performed by certified air carriers (i.e., Reeve), about half were by air taxis and commuters, while the other half were performed by general aviation aircraft.

Flying Tiger used to stop at Cold Bay to refuel its DC-8 freighters on transoceanic flights. They have not used Cold Bay since 1980, because they now operate larger B-747 freighters

TABLE 20

AIR CARRIER TRAFFIC AND OPERATIONS STATISTICS  
FOR COLD BAY<sup>a</sup>

	<u>1979</u>	<u>1980</u>	<u>PERCENT CHANGE</u>
<u>Enplaned Passenger</u>			
Scheduled	21,096	24,898	
Non-scheduled	120	68	
Total	21,216	24,966	<b>+17.7%</b>
<u>Enplaned Revenue Tons</u>			
Freight	398.25	455.58	
Mail	327.91	475.73	
Total	726.16	931.31	<b>+28.3%</b>
<u>Operations by Aircraft Type</u>			
<u>Scheduled</u>			
<b>C-46s</b>	<b>73</b>	<b>-</b>	
<b>YS-11s</b>	754	816	
L-188 A/C	445	487	
Total Scheduled	1,272	1,303	<b>+2.4%</b>
<u>Non-Scheduled</u>			
<b>YS-11s</b>	9	3	
L-188	4	2	
Total Non-Scheduled	13	5	
<b>Total Operations</b>	<b>1,285</b>	<b>1,308</b>	<b>+1.8%</b>
Departures Scheduled	1,137	1,185	<b>+4.2%</b>
Scheduled Departures	1,080	1,163	
Percentage of Departures Scheduled	95%	98%	

<sup>a</sup>**Includes** only operations of certified air carriers. In this case, all traffic is by Reeve Aleutian Airways. Small aircraft and air taxi operations and refueling stopovers by all carriers are not included.

Source: CAB Airport Activity Statistics, Annual

through Anchorage, and Cold Bay is not equipped to refuel B-747's. Flying Tiger indicates that if such equipment were installed, it would consider using Cold Bay once again.

Air carrier passenger traffic at Cold Bay grew strongly during the mid and late 1970's (Table 21). From 1974 to 1980, passenger enplanements increased 26 percent per annum. This increase has occurred as the Alaskan and Aleutian fisheries have expanded and in spite of the reduction of military personnel stationed on the Chain since the Vietnam War. Cargo enplanements originating from the Cold Bay airport have been relatively static, however. While the Aleutian economy has been growing, the community of Cold Bay itself has little economic function other than as an airport.

Reeve's total aircraft operations have also been static. This is due partly to the fact that the carrier has used larger aircraft to service the airport to meet increased demand.

### St. Paul

St. Paul is an Aleut island sealing community. Its airport is considered a "community" airport, serving only St. Paul Island traffic. The airport was built and is owned by the Federal government and is under the National Marine Fisheries Service. It is a public domain airport. No aircraft are based on St. Paul Island.

The airstrip is about 7 kilometers (4 miles) northeast of the main settlement of the island. It is 241 kilometers (150 statute miles, 130 nautical miles) from the nearest part of the lease sale area, and 708 kilometers (440 statute miles, 383 nautical miles) from the farthest point.

Runways, Taxiways and Aprons. The single runway runs north to south, and measures 1,555 meters (5,100 by 150 feet). It is surfaced with scoria, a type of gravel. There is no taxiway or apron. There is an exit ramp leading to a concrete parking ramp. A 3-foot-deep drainage swale runs along the west side of the runway. The configuration of the airport is given in Figure 23.

Nav aids. An NDB with DME at the field permits non-precision instrument approaches. Reeve also maintains an NDB at the field for its own use. Hills on the island shield the DME

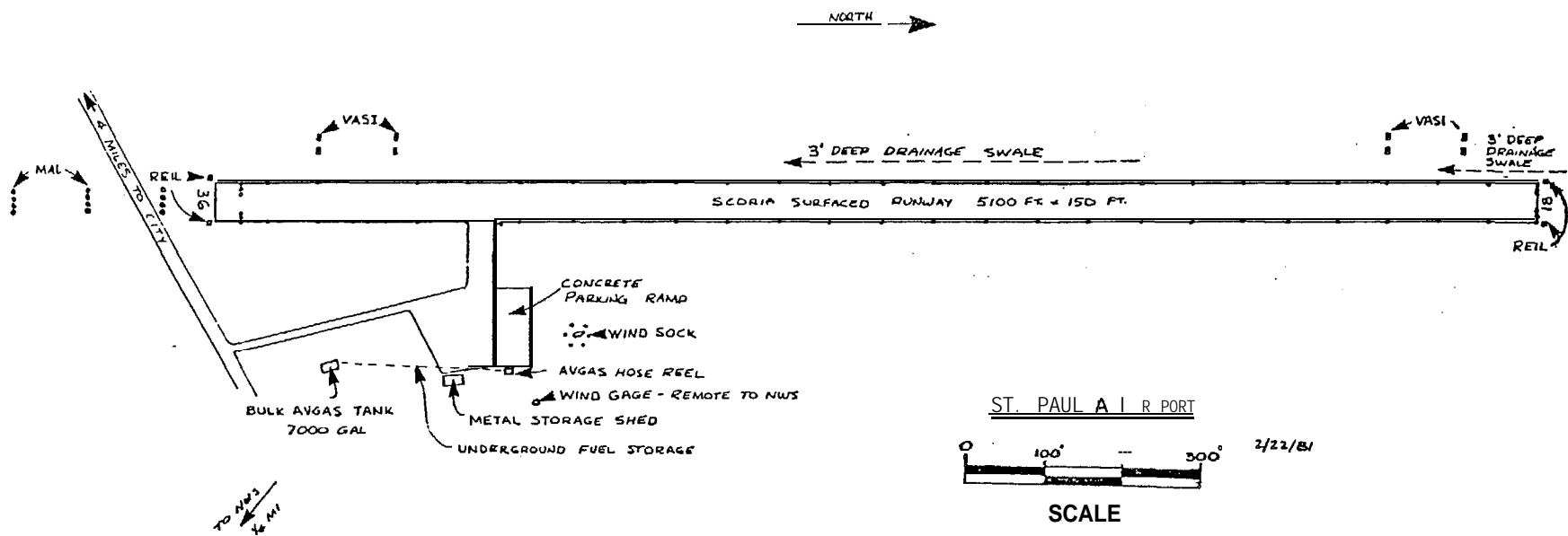
TABLE 21

REEVE ALEUTIAN AIRWAYS: AIR TRAFFIC AND OPERATIONS AT COLD BAY, 1974-1980

YEAR	REVENUE TRAFFIC			
	ENPLANED	ENPLANED REVENUE TONS		
	<u>PASSENGERS</u>	<u>MAIL</u>	<u>FREIGHT</u>	<u>TOTAL</u>
1974	6,488	244.2	814.4	1,058.6
1975	6,877	301.8	339.0	640.8
1976	7,942	252.3	427.9	680.3
1977	9,233	182.7	293.2	475.9
1978	10,436	<b>177.1</b>	240.8	417.9
1979	21,216	327.9	398.3	726.2
1980	24,966	475.7	455.6	931.3
Average				
Annual				
Growth Rate,				
1974-1980	<b>+25.9%</b>	<b>+11.8%</b>	-9.2%	-2.1%

	AIRCRAFT OPERATIONS		
	<u>SCHEDULED</u>	<u>UNSCHEDULED</u>	<u>TOTAL</u>
1974	1,291	195	1,486
1975	1,251	47	1,298
1976	1,244	56	1,300
1977	1,021	11	1,032
1978	1,146	7	1,153
1979	1,272	13	1,285
1980	1,303	5	1,308
Average			
Annual			
Growth Rate			
1974-1980	<b>+0.2%</b>	-45.7%	-2.1%

Source: CAB Airport Activity Statistics, Annual



SOURCE: NATIONAL MARINE FISHERIES SERVICE

TRANSPORTATION  
IMPACT ANALYSIS  
NAVARIN BASIN

SAINT PAUL  
AIRPORT

FIGURE 23

from aircraft at low cruise attitudes at certain bearings north of the, field.

Lighting. To assist approaches, there are VASI lights at both ends of the runway for rate-of-descent guidance. There are also REIL lights marking the thresholds. There are touchdown zone approach lighting systems. There are medium intensity runway lights (MIRL) available on radio request to the National Weather Service facility. Airborne pilots can illuminate the VASI, REIL, and approach lights by "keying" their radio microphones on the appropriate frequency.

Communications. The airport is unattended, without a tower and air traffic control and without a Flight Service Station. There is a local radio station operated by the National Weather Service, and a tie-in to the Cold Bay Flight Service Station. Anchorage center handles approach/departure control.

Service. The only scheduled commercial service to St. Paul is provided by Reeve in Electras. From Anchorage, the Electra stops in Cold Bay, then stops at St. Paul on its return to Anchorage. During summer the island is served by three flights per week, in winter by fewer.

Traffic Activity. In recent years there have been between 2,000 and 2,500 passenger enplanements per year at St. Paul, and a similar number of deplanements (see Table 22). At the same time, there have been 40 to 50 tons of freight enplaned annually from the island.

Air carrier operations grew by one fifth from 1979 to 1980, and scheduled flights were up one third. In 1980 there were an average of two scheduled flights per week. This traffic is augmented by air taxi and general aviation operations, which of course carry much less revenue traffic but probably contribute a similar number of aircraft visits.

Air carrier traffic enplanements grew at an average of nine percent per year during the 1974-1980 period (see Table 23). During the same period, freight enplanements fluctuated but maintained approximately the same level. Air carrier operations remained fairly constant at around 80 to 85 per annum until 1980, when they increased sharply. Total aircraft operations seem to have increased over the period.

TABLE 22

AIR CARRIER TRAFFIC AND OPERATIONS STATISTICSST. PAUL ISLAND

	<u>1979</u>	<u>1980</u>	<u>PERCENT CHANGE.</u>
<u>Enplaned Passenger</u>			
Scheduled	2,237	2,226	
Non-scheduled	98	--	
Total	2,335	2,226	-4.7%
<u>Enplaned Revenue Tons</u>			
Freight	23.67	28.48	
Mail	17.67	22.76	
Total	41.34	51.21	+23.9%

Operations by Aircraft Type

<u>Scheduled</u>			
YS-11s	3	71	
L-188 A/C	83	37	
Total Scheduled	86	108	+25.6%
<u>Non-Scheduled</u>			
YS-11s	3	--	
Total Operations	89	108	+21.3%
Departures Scheduled	81	109	+34.6%
Scheduled Departures	78	105	
Percentage of Departures Scheduled	96%	96%	

Source: CAB Airport Activity Statistics. . All traffic is by Reeve Aleutian Airways.

TABLE 23

REEVE ALFUTLAN AIRWAYS: AIR TRAFFIC AND OPERATIONS AT St. Paul, 1974-1980

<u>YEAR</u>	<u>REVENUE TRAFFIC</u>			
	<u>ENPLANED PASSENGERS</u>	<u>ENPLANED MAIL</u>	<u>REVENUE FREIGHT</u>	<u>TONS TOTAL</u>
1974	1,329	31.3	28.2	59.5
1975	1,505	25.9	14.5	40.4
1976	1,994	30.1	27.3	57.4
1977	2,083	25.6	24.0	49.6
1978	2,080	20.0	10.7	30.7
1979	2,335	<b>17.7</b>	23.7	41.4
1980	2,226	22.8	28.5	51.3
Average Annual Growth Rate, 1974-1980	+9.0%	-5.1%	+0.2%	-2.4%

	<u>AIRCRAFT OPERATIONS</u>		
	<u>SCHEDULED</u>	<u>UNSCHEDULED</u>	<u>TOTAL</u>
1974	83	--	83
1975	n/a		
1976	82	3	85
1977	<b>83</b>	1	84
1978	81	2	83
1979	86	3	89
1980	108	--	108
Average Annual Growth Rate 1974-1980	<b>+4.5%</b>	--	+4.5%

Source: CAB. Airport Activity Statistics.

## AVIATION SERVICES

### Climate and Weather

The study area is in a maritime climatic zone. Pack ice is found in the Pribilofs area from early February to late April, and along the north of the Alaska Peninsula from late December to late April. The southern Alaska Peninsula and Aleutian Chain are warmed by the Alaska current. Average winds along the Chain and southern end of the peninsula range from 10 to 20 knots.

Fog and precipitation are the main obstacles to aviation activity in the study area. Fog is a problem year-round but especially in summer (see Table 24) rain, snow or fog accompanied by clouds, low ceilings, and restrictions to visibility as well as winds strong enough to cause discomfort to pilots can occur year-round.

Bad and changeable weather, with few weather reporting stations, means that aircraft often are grounded or cannot get in to their destination airport. The geography compounds these difficulties as aircraft must be wary of mountains and high ground which often surround airstrips located at low altitudes. Wind speeds are often fast enough to complicate take-offs and landings. The effect of the terrain and weather on aircraft operations is compounded by the limited infrastructure available: only Cold Bay airport capable of handling precision instrument approaches.

The scheduled air service in the Aleutians is all offered by operators mainly serving the Aleutian region. One, Reeve, has a fleet of large turboprop aircraft and offers interstate, interregional, and regional service. It's subcontractor, Peninsula Airways, operates smaller piston aircraft and offers intraregional service. AirPac has recently moved from smaller piston airplanes and is now challenging Reeve on the Unalaska-Anchorage route.

TABLE 24

INCIDENCE OF CLOUD CEILINGS AND VISIBILITY CONDITIONS FOR  
COLD BAY, UNALASKA AND ST. PAUL ISLAND

	VISIBILITY GREATER THAN OR EQUAL TO:		
	<u>3 MILES</u>	<u>1 1/2 MILES</u>	<u>1 MILE</u>
Cold Bay	88%	94%	96%
Unalaska	89%	94%	96%
St. Paul Island	80%	86%	90%

	CEILING GREATER THAN OR EQUAL TO:		
	<u>1,500 FEET</u>	<u>1,000 FEET</u>	<u>500 FEET</u>
Cold Bay	70%	82%	95%
Unalaska	78%	86%	96%
St. Paul Island	55%	70%	85%

Source: Climatic Atlas, Volumes I and II, U.S. Department of Interior, Bureau of Land Management. Based on hourly observations.

## Air Carriers

Reeve Aleutian Airways. For years, Reeve Aleutian Airways provided the only interregional scheduled air service into the Aleutians and dominated intraregional service as well. Its three Electras and three YS-11's give it by far the most capacity of any carrier offering service in the Aleutians. It maintains a system of its own terminals at major points of service. Given the current deregulatory mood of aviation policy makers and the growth of the region's economy, particularly fishing, the virtual monopoly long held by Reeve is being challenged by would-be market entrants.

AirPac. Based in Dutch Harbor, AirPac operated two Gruman G-21A's, a Cessna 441, and a Swearingen SA 22GTC Metro as of late 1981. The piston Cessna seats ten, while the Swearingen Metro twin turboprop seats 20 passengers.

AirPac has taken the step up from a local to a interregional carrier. In May 1982 it started offering scheduled non-stop passenger and cargo service between Anchorage and Unalaska. By August it was using the much larger F-27 on its route, with an arrangement with Alaska Airlines to market tickets. It charges the same as Reeve, \$330 one-way, but offers much shorter trip times as it does not transfer aircraft at Cold Bay nor stop at any airports along the way.

Peninsula Airways. Peninsula Airways is a fixed base operator with bases in King Salmon and Cold Bay. In late 1981 it operated 17 single and twin engine piston propeller aircraft, including various Piper twins, a Britan-Norman Islander, the Grumman Goose, and a couple of Cessnas.

Peninsula provides weekly scheduled mail service under contract to Reeve to many of the smaller communities including: King Cove, False Pass, Nikolski, and Akutan. Peninsula also provides charter service to these communities as well as to Nelson Lagoon, Port Moeller, Sand point, Unalaska, St. Paul, and St. George.

Non-Scheduled Service. Most of the charter service on the Aleutians and on the Alaska Peninsula is of the air taxi variety to small Aleut communities by small piston aircraft. Peninsula

provides most of this type of service locally. Fixed base operators based on the Kenai Peninsula and along Bristol Bay **also** provide such service into the region. In August 1982, a new operator named Aleutian Air has applied for an ATC certificate to operate charter freight and passenger service out of **Unalaska** using a Twin Beech E-18.

Alaska International Airlines has been active in the region, using its large Hercules cargo aircraft for charter flights.. While some of its activity has been fish hauls, most has been contract work for the military.

Route Structure. The route structure of the Aleutians is mainly affected by geography and infrastructure constraints. Figure 24 depicts the basic air route structure in the **Aleutian-Priblof** region.

The traditional regional center for aviation activity in the Aleutian **Islands/Pribilofs/southern** Alaska Peninsula region is Cold Bay. The airport there was built during World War II for defense purposes, and is the best facility in the region. However, there is very little economic activity at Cold Bay not associated with the airport.

The economic center of the region is **Unalaska**, which is also the regional center for maritime commerce and fishing. No doubt **Unalaska** would be the center of aviation activity for the region were it not for the fact that it's airfield is short, small, and dangerous. The largest passenger aircraft which can safely use **Unalaska** is a 40-50 passenger twin turboprop.

The rest of the airports receiving commercial service are either Native villages, fishing communities, or military bases. They are linked to Cold Bay by small air taxis or by turbine aircraft providing stop-off service.

Interregional Routes. At present there are interregional links with the Pacific Northwest, via Seattle; with the hub of Alaska, Anchorage; and stop-off service with the Bristol Bay port of King Salmon.

Intraregional Routes. There are basically two sorts of scheduled routes in the region: Reeve, and scheduled air taxi service. Reeve flies passengers via an airplane change from

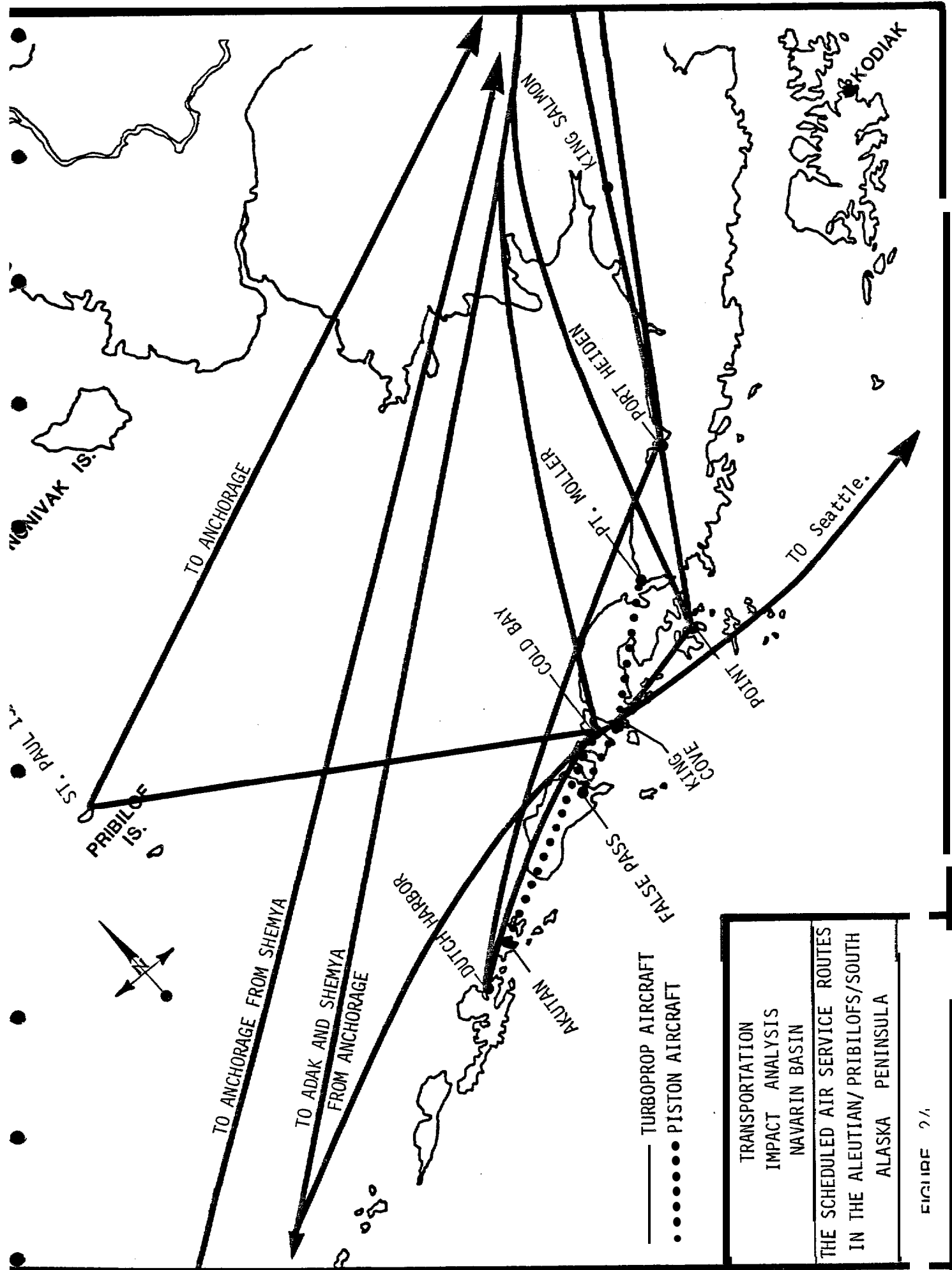


FIGURE 2/1

Anchorage to Cold Bay and on to Unalaska, and all the way out the chain to the military bases at Shemya. Along the way it provides stop-off service in its large turbine aircraft to smaller communities, such as Port Heiden and St. Paul. Service to other communities is provided from Cold Bay by small piston aircraft principally by Reeve's subcontractor, Peninsula Airways.

**Seasonality.** Like the state as a whole, the Aleutian/Pribilof/Alaska Peninsula region has a strong annual cycle in aviation activity. This is due to the fact that the daylight hours and thus VFR aircraft operating hours are much shorter in the winter than in summer and the region's main economic activities mainly fishing but also sealing, are much less active in winter (after January). Off season is typically 40 percent less than the busy season. Operators adjust to this seasonal cycle by scheduling fewer flights in winter and spring than in late summer and fall.

#### Equipment Utilization

The scheduled service aircraft type utilization pattern of the Aleutians is somewhat atypical for Alaska. Reeve's large four engine turboprop Electras provide interregional service linking Cold Bay non-stop to Anchorage and Seattle and also fly out the chain to Adak and Shemya and north to St. Paul. A twin turboprop F-27 now provides interregional service directly between Anchorage and Unalaska. Reeve's twin turboprop YS-11's provide both interregional and intraregional service, stopping at Cold Bay, Unalaska, King Salmon, Port Heiden and Sand Point on their way out the chain from Anchorage. There are no jets in scheduled service to the Aleutians. Turboprops serve the long hauls and larger communities, providing intraregional "stop-off" service at some of the smaller communities along the way.

Smaller piston twin engine aircraft with six to ten seats provide intraregional scheduled service into the smaller communities. Pipers and Grummans serve Cold Bay, False Pass, Nikolski, King Cove, and Port Heiden.

Charter service is provided by a single engine aircraft. Peninsula Air Service also employs single engine Pipers for scheduled air taxi service in the region.

The more typical Alaskan pattern consists of scheduled inter regional Boeing 727 or 737 jet service from Anchorage or Fairbanks feeding into intraregional and local service provided by locally based operators flying smaller piston propeller aircraft. The Aleutians differ in that they are not served by jets, while turboprops provide not only interregional service but a significant proportion of the intraregional service.

Other than in the Southeast, Alaskan service regions are linked to the outside world via the hubs of Anchorage or Fairbanks. Thus, the direct route to Seattle from Cold Bay is also therefore atypical.

Equipment choice and utilization in the Aleutians is affected by the long hauls over water, between some points, which tends to favor turboprops over piston aircraft, and by airfield constraints, which makes jet service to Unalaska unfeasible.

Lockheed Electra. The L188 Electra was produced in 1950's by Lockheed and, one of the first large turboprop airliners ever produced, after the British Viscount. About 150 commercial Electras were produced, a significant but not large production run. Over 100 of these aircraft are still in service, which indicates that it was a very technically successful, well built airplane that proved to be economically viable as well. The Electra has four Allison turboprop engines generating 15,000 total horsepower. Its maximum gross takeoff weight is 116,000 pounds with a payload of 22,000 pounds. Depending upon seating arrangements, it can carry 66 to 100 passengers and is, of course, pressurized. It cruises at 405 miles per hour with a range of 2,750 miles. It is 104.5 feet long with a wingspan of 99 feet.

YS-11. The YS-11 was produced in Japan by Nihon, and is now out of production. It is considered one of the best commercial turboprop twins in terms of engineering and performance. Its two turboprops deliver 6,120 total horsepower. Its maximum gross take-off weight is 51,800 pounds with a payload of 12,550 pounds. Depending on configuration, it can carry 50 or more passengers and is pressurized. It cruises at 292 miles per hour and has a range of 1980 miles. It is 80 feet long with a wingspan of 105 feet.

F-27 Friendship. Originally and still produced in Holland by **Fokker**, the F-27 has also been produced by Fairchild in the United States under license. The F-27 is one of the most popular commercial turboprop ever, and several hundred have been produced since the 1950's. The F-27 is powered by two turboprop engines with 3,430 total horsepower. Its maximum gross take-off weight is 45,000 pounds, with a payload of 13,500 pounds. Depending on configuration, it carries some 40 or more passengers and is pressurized. It cruises at 265 miles per hour, and has a range of 1,450 statute miles. It is 82 feet long with a wingspan of 95 feet.

Grumman Goose. This amphibious aircraft was produced in the U.S. by Grumman, later **Gulfstream** American. Its twin propeller power plants deliver 800 total horsepower. Its maximum gross take-off weight is 8,000 pounds with a payload of 2,000 pounds, and it carries ten passengers. It is unpressurized. It cruises at 160 miles per hour with a range of 825 miles. It is 35 feet long with a 49 foot wingspan.

Piper Navajo. The Navajo is a U.S. produced twin piston propeller general aviation type airplane. It can carry six or eight passengers? or a payload of 2,750 pounds. It cruises at 275 miles per hour with a range of 1,243 miles. It is unpressurized. Other twin engine aircraft with similar performance characteristics are also used in the region.

### Tariffs

Table 25 shows distance, coach air fares and costs per kilometer and per mile for regular scheduled intraregional and interregional flights in the study area.

Aircraft exhibit declining per-kilometer costs with increasing stage length distances. Not surprisingly, the cheapest route in terms of cost per kilometer is the longest route, Seattle to Cold Bay. The second, third, and fourth longest routes are also the second, third and fourth cheapest routes in terms of cost per kilometer; these routes are Anchorage-Adak, St. Paul-Anchorage, and Anchorage-cold Bay.

When comparing the interregional and regional routes, it is apparent that intraregional routes cost more per unit of distance

TABLE 25

DISTANCES, FARES, AND COSTS OF AIR TRAVEL IN ALASKA  
AND THE LOWER FORTY-EIGHT

	DI STANCE		AI RFARE	COST/KM	COST/MI LE	TIME EN ROUTE
	KI LOMETER	MILES				
<u>Interregional</u>						
Seattl e-Col d Bay	2, 775	1, 725	\$339. 52	12.2¢	19.7¢	3:20
Anchorage-Adak	1, 932	1, 210	\$379. 00	19.6¢	31.3¢	3:50
Unalaska-Anchorage	1, 287	800	\$333. 00	25. 6¢	41.3¢	3:15
St. Paul -Anchorage	1, 205	750	\$354. 50	29.4¢	47.3¢	2:15
Anchorage-Col d Bay	1, 005	625	\$256. 00	25.5¢	54. 3¢	2:00
Col d Bay-Ki ng Sal mon	523	325	\$159. 00	30. 4¢	48. 9¢	2:15
<u>Intraregional</u>						
Col d Bay-Ki ng Cove	32	20	\$ 38. 00	118.8¢	190.0¢	0:10
Cold Bay-Sand Point	145	90	\$ 60. 00	41.4¢	66. 7¢	0:30
Cold Bay-Dutch Harbor	290	180	\$ 75. 50	26.0¢	41.9¢	0:55
Col d Bay-St. Paul	581	322	\$143. 50	27. 7¢	44. 6¢	1:10
Adak-Shemya	645	400	\$186. 50	28.9¢	46.6¢	1:25

Source: Official Airlines Guide, July 15, 1982. Non-stop connections and "Y" fares used. All flights are by Reeve or its subcontractors. Miles are statute miles.

than inter regional routes. This is due not **only** to shorter distances, but also to the fact that the **intraregional** routes tend to be serviced by smaller aircraft, either twin-turbine YS-11 or piston twins, rather than the four engine turboprop **Electras**. Bigger aircraft are **generally** more efficient per ton-kilometer or passenger to kilometer than small aircraft over appropriate stage lengths. Smaller aircraft are required on the intraregional routes due to both airport constraints (short rough runways) and lower levels of traffic.

Table 26 shows selected air fares, distances and costs for selected routes in Alaska and the Lower 48. This allows for a comparison between air travel costs in the study region, other parts of Alaska, and the rest of the country.

When comparing the study region's costs per kilometer are compared with those elsewhere in Alaska, it is apparent that the heavily travelled routes (e.g., Anchorage to Fairbanks or Juneau) are considerably cheaper than study area routes of comparable distance. In part, this is due to the use of jets on these routes. However, when compared to some lightly travelled jet routes (e.g., Unalakleet to Nome), study area costs per kilometer are lower.

On the Seattle-Cold Bay route the cost is about 1.6 cents per kilometer more expensive than the cost between Seattle-Anchorage for a regular coach fare. The regular fare cost per kilometer for the Juneau-Seattle run is quite close to the Cold Bay-Seattle cost.

Costs per unit of distance for stage lengths in the Lower 48 are cheaper than for comparable stage lengths in the study area. This gap is understated by the figures presented when one considers that, in general, special cheaper fares are available on heavily travelled routes in the Lower 48, while such "deals" are usually unavailable in rural Alaska. However, costs on the high-traffic Alaskan routes appear to be similar to air travel costs in the Lower 48.

TABLE 26

DISTANCES, FARES, **AND** COSTS OF AIR TRAVEL IN ALASKA  
AND THE LOWER FORTY-EIGHT

	DI STANCE			COST/KM	COST/MI LE	TIME EN ROUTE
	KI LOMETER	MI LESAI RFARE				
<u>Al aska</u>						
Anchorage-Juneau	895	556	\$148. 00	16.5¢	26.6¢	1:35
Anchorage-Fai rbanks	412	256	\$85. 00	20. 6¢	33.2¢	0:50
Juneau-Ketchikan	380	236	\$76. 00	20.0¢	32.2¢	0:50
Nome-Kotzebue	291	181	\$ 79. 00	27.1¢	43.6¢	0:40
Nome-Unalakleet	238	148	\$107. 00	45.0¢	72.3¢	0:55
<u>Lower Forty-Eight</u>						
New York-Los Angel es	3,982	2,475	\$394. 00	9.9¢	15.9¢	5:00
Chi cago-Los Angel es	2,808	1,745	\$379. 00	13.5¢	21.7¢	3:45
New York-Chi cago	1,190	740	\$210. 00	17.6¢	28.4¢	1:50
Seattl e-San Franci sco	1,090	678	\$119. 00	10.9¢	17.6¢	1:40
New York-Bal ti more	256	159	\$ 55. 00	21.5¢	34.6¢	0:50
Seattl e-Portl and	212	132	\$ 28. 00	13.2¢	21.2¢	0:35
<u>Al aska/Lower Forty-Eight</u>						
Anchorage-Seattl e	2,315	1,438	\$245. 00	10.6¢	17.0¢	3:15
Juneau-Seattl e	1,456	905	\$189. 00	13.0¢	20.9¢	2:15

Source: Official Airlines Guide, July 15, 1982. Non-stop direct connections and "Y" fares used.

CHAPTER IV  
BASE CASE

#### IV. BASE CASE

##### Introduction

The Base Case is an important part of the transportation impact analysis because it **serves as** the scale on which the changes in the demand for transportation service, resulting from the Navarin Basin lease sale and the subsequent development which might occur, can be measured. The base case analyzes the future situation if the lease sale did not occur. Thus, the Base Case is a non-OCS case. This is reflected in the forecasts of economic activity given by the **SCIMP** (Small Community Population Impact Model) and MAP (Man in the Arctic Program) model. The **SCIMP** and MAP model are economic and demographic models which forecast activity at the statewide (MAP) and census division and community level (**SCIMP**).

The Base Case represents a static situation where there is, in general, no particular response to events by the transportation industry, affected communities, or public agencies involved in providing infrastructure or regulatory control of the industry. However, there are the following two exceptions which would occur because of the degree of planning that has already gone into the projects and the importance of the projects themselves to the communities involved. They are:

- 1) A new port at St. Paul, and
- 2) The extension of the runway on at Unalaska to 1,982 meters (6,500 feet).

The time of the completion of these projects is based upon reasonable estimates of the delays which are likely to occur in their implementation (permitting, design, financing, construction). The port at St. Paul is expected to be completed by 1985 and to be operational the next year. The airport extension at Unalaska-Dutch Harbor is, because of its great cost, not expected to be completed prior to 1994. Any other additions or improvements to existing conditions, including routes or services, are not considered as part of the Base Case unless their funding has already been committed or is likely to be funded.

## Economic Factors Affecting Growth

Transportation results from a derived demand and is closely linked to the economic activity in an area. This section describes briefly some of the economic factors which are likely to affect the development of the Aleutian Pribilof census area.

The economic forecasting methodology is described in "Technical Memorandum NB-3: Methods, Standards and Assumptions, State and Census Division Economics and Demographics, Navarin Basin (83) Impact Analysis (Gunnar Knapp, 1982)." The results of the analysis (SCIMP run 162) are given in Appendix B. The prime factor affecting growth is the development of the bottomfish industry as shown in Appendix B; this industry is expected to grow rapidly. A temporary factor affecting the region is the OCS activity in connection with the exploration phase of the St. George lease sale (No. 70).

### POPULATION FORECASTS

Only regional population data for the Aleutian-Pribilof census region were given to the Consultant (SCIMP run 162). In order to forecast transportation demand at Unalaska-Dutch Harbor, Cold Bay, and the Pribilof Islands, it is necessary to have estimates of the population in these communities. These estimates were made by comparing the 1981 regional resident civilian population given to the Consultant and those used in Technical Report 58 (Peat, Marwick, Mitchell & Co., 1981) i.e., 4,208 to 3,777. The resident population in each community for 1981 was estimated by multiplying the data given in Technical Report 58 with the regional ratio (1.114). The 1981 enclave population was estimated in the same fashion as was the residential population except for St. Paul. Here 41 persons used in Technical Report 58 remained unchanged.

The regional growth in resident population provided to the Consultant is 4 percent per "year over the forecast period. Unalaska-Dutch Harbor, with the largest proportion of population (33.8 percent), is expected to have the highest rate of growth in region, i.e., 6 percent per year resulting from the development of the bottomfish industry which will be centered at this community. This growth rate will result in Unalaska-Dutch Harbor

having about 50 percent of the region's population in 2000. The average growth rate of the remaining resident population of the region is 2.3 percent per year. Cold Bay is assumed to have a growth rate of 2.5 percent per year, slightly above average, and St. Paul, a one percent annual growth rate. This low growth rate for St. Paul assumes that there is no development of a bottomfish processing industry at this island and that very few new economic opportunities for the residents of the island are to be expected over the forecast period.

The regional growth in non-resident enclave population is 5.8 percent per year based on the data provided to the Consultant. Since the bottomfishing industry will be centered in Unalaska-Dutch Harbor, a growth in this population is estimated to be around 7 percent per year. The remaining regional non-resident enclave population will grow at 4.7 percent per year. Cold Bay's population is expected to grow at 5 percent per year. For St. Paul, the present enclave population of 41 connected with the U.S. Coast Guard will remain constant at 41 until several years after the boat harbor is completed in 1985. With a sheltered harbor, St. Paul can be expected to attract a certain number of fishing boats which will use this island as a center for their seasonal operations. Initially it is estimated that 20 boats will operate from this port. Crew and supporting personnel are estimated to be about 10 per boat; thus, the non-resident enclave population of St. Paul in 1990 is expected to be 200 fishermen plus 41 persons connected with the seal industry for a total of 241. The non-resident fishermen are expected to grow at 5 percent per year until 2000.

Tables 27, 28 and 29 summarize the results of this analysis; they show the forecast of the resident, the non-resident, and the total population for the region and the three communities of Unalaska, Cold Bay, and St. Paul.

#### FISHERIES FORECAST

##### Bottomfish

The on-shore processing industry for the bottom fishery in the Bering Sea/Aleutian region will be centered at Unalaska-Dutch Harbor. Consequently, there will be no processing of bottomfish at St. Paul during the time frame of this study.

TABLE 27  
RESIDENT POPULATION

	<b>REGIONAL<sup>a</sup></b>	<b>UNALASKA DUTCH HARBOR<sup>b</sup></b>	<b>COLD BAY<sup>c</sup></b>	<b>ST. PAUL<sup>d</sup></b>
1981	4,208	1,427	175	541
1982	4,401	<b>1,513</b>	179	546
1983	4,571	1,603	184	551
1984	4,730	<b>1,700</b>	189	557
1985	4,875	1,802	193	563
1986	5,005	<b>1,910</b>	198	568
1987	5,121	2,024	203	574
1988	<b>5,226</b>	2,146	208	580
1989	5,337	2,274	213	585
1990	5,448	2,411	219	591
1991	5,567	2,556	224	597
1992	5,701	2,709	230	603
1993	5,857	2,871	236	609
1994	6,046	3,044	241	615
1995	6,278	3,226	247	621
1996	6,571	3,420	254	628
1997	6,944	3,625	260	634
1998	7,428	3,843	266	640
1999	8,063	7,073	273	647
2000	8,822	4,318	280	653

<sup>a</sup>Figures obtained from SCIMP 163, BRESPOP.

<sup>b</sup>Figures obtained by multiplying similar figure in TR58 Table 32 by 1.114 regional ratio; then by 1.06 growth rate.

<sup>c</sup>Figures obtained by multiplying similar figure in TR58 Table 33 by 1.114 regional ratio; then by 1.025 growth rate.

<sup>d</sup>Figures obtained by multiplying similar figure in TR58 Table 34 by 1.114 regional ratio; then by 1.01 growth rate.

Sources: SCIMP 163 for regional forecasts; Louis Berger & Associates, Inc.

TABLE 28

NON-RESIDENT ENCLAVE POPULATION

	REGION			UNALASKA	COLD BAY	ST. PAUL
	ENCLAVE	FISHERMEN	TOTAL	DUTCH HARBOR		
1981	1,656	717	2,373	1,003	102	41
1982	1,657	774	2,431	1,073	107	41
1983	1,743	911	2,654	1,148	112	41
1984	1,791	1,093	2,884	1,228	118	41
1985	1,817	1,280	3,097	1,314	123	41
1986	1,797	1,474	3,271	1,406	130	41
1987	1,751	1,677	3,428	<b>1,504</b>	135	41
1988	1,677	1,889	3,566	1,610	142	41
1989	1,685	2,035	3,720	1,722	149	41
1990	1,696	2,116	3,812	1,843	157	241
1991	1,710	2,216	3,926	1,972	164	251
1992	1,730	2,340	4,070	2,110	172	262
1993	<b>1,756</b>	2,492	4,248	2,258	181	273
1994	1,792	2,680	4,472	2,416	190	284
1995	1,838	2,910	4,748	2,585	200	296
1996	1,901	3,190	5,091	2,766	209	309
1997	1,984	3,532	5,516	2,960	220	322
1998	2,095	3,946	6,041	3,167	231	336
1999	2,243	4,447	6,690	3,389	242	351
2000	<b>2,440</b>	4,473	6,913	3,627	254	367

Source: SCIMP 163 for regional forecasts; Louis Berger & Associates, Inc.

TABLE 29

POPULATION TOTALS

	REGIONAL <u>TOTAL</u>	<b>UNALASKA</b> <u>DUTCH HARBOR</u>	<u>COLD BAY</u>	<u>ST. PAUL</u>
1981	6,581	2,430	277	582
1982	6,832	2,586	286	587
1983	7,225	2,751	296	592
1984	7,614	2,928	307	598
1985	7,972	3,116	316	604
1986	8,276	3,316	328	605
1987	<b>8,549</b>	3,528	338	615
1988	8,792	3,756	350	621
1989	9,057	3,996	362	626
1990	9,260	4,254	376	832
1991	9,493	4,528	388	848
1992	9,771	4,819	402	865
1993	10,105	5,129	417	882
1994	10,518	5,460	431	899
1995	11,026	5,811	447	917
<b>1996</b>	<b>11,662</b>	6,186	463	937
1997	12,460	6,585	480	1,197
1998	13,469	7,010	497	1,217
1999	14,753	7,462	515	1,239
2000	15,736	7,945	534	1,261

Source: SCIMP 163 for the regional forecasts; Louis Berger & Associates.

The harvest of bottom fish, appearing in Table 30 was provided to the Consultant (SC IMP 163). In this table, the bottomfish processed represents tonnage of bottomfish before 35 percent recovery, which is the minimum recovery level during processing (Technical Report 60, E.R. Combs, 1981). The forecasted tonnage processed (after the weight reduction) is expressed in metric tons, and this quantity will be shipped as outbound cargo from Unalaska-Dutch Harbor.

### Traditional Fish

The forecasts for the Bering Sea/Aleutian traditional fisheries involve king and tanner crab, as well as shrimp. The potential total quantity of fish from these sources is 116,000 metric tons (MT) and this value is assumed to remain constant over the forecast period (Technical Report 60, E.R. Combs, 1981). The forecast of processed traditional fish is taken from Table 37 in Technical Report 58 (Peat, Marwick, Mitchell & Co., 1981), and is converted from short tons to metric tons. There is only a slight increase in the tonnage of traditional fish shipped from Unalaska-Dutch Harbor over the forecast period. Table 30 summarizes these values.

### SPECIAL CONSIDERATIONS

As discussed there are two projects which are now in the planning stage and which could have major impacts upon the transportation system in the Aleutian-Pribilof region and, consequently, on the traffic forecasts. These projects are the runway extension at Unalaska-Dutch Harbor and a small port at St. Paul.

The runway extension (see Figure 25) will allow the operation of a Boeing 737 jet. The range of the Boeing 737 is long enough to permit direct flights from Anchorage to Unalaska, thus by-passing Cold Bay. The structural change would have a dramatic impact upon the traffic patterns in the region. (For further discussion, see the section on aviation forecasts in this chapter.) Because of its great cost, between \$60 and \$70 million, this infrastructure investment is not expected to be built before 1994.

TABLE 30  
FISHERIES FORECASTS  
(1,000 MT)

YEAR	TRADITIONAL Fisheries		BOTTOMFISH		TOTAL
	<u>HARVEST<sup>b</sup></u>	<u>PROCESSED</u>	<u>HARVEST<sup>c</sup></u>	<u>Processed</u>	
	(MT)	(MT)	(NT)	(MT)	(MT)
1981	116.0 <sup>a</sup>	29.9	0.4	0.1	30.0
1982	116.0	30.3	0.5	0.2	30.5
1983	116.0	30.5	0.7	0.3	30.8
1984	116.0	30.8	1.0	0.4	31.2
1985	116.0	31.2	1.4	0.5	31.7
1986	116.0	31.5	1.9	0.7	32.2
1987	116.0	31.8	2.6	0.9	32.7
1988	116.0	32.1	3.6	1.3	33.4
1989	116.0	32.5	4.9	1.7	34.2
1990	116.0	32.8	6.7	2.3	35.1
1991	116.0	33.1	9.2	3.2	36.3
1992	116.0	33.5	12.6	4.4	37.9
1993	116.0	33.8	17.3	6.1	39.9
1994	116.0	34.1	23.7	8.3	42.4
1995	116.0	34.4	32.4	11.3	45.7
1996	116.0	34.8	44.4	15.5	50.3
1997	116.0	35.2	60.8	21.3	56.5
1998	116.0	35.5	83.2	29.1	64.6
1999	116.0	35.8	113.9	39.9	75.7
2000	116.0	36.2	155.9	54.6	90.8-

<sup>a</sup>Sources are Comb, 1981 and Technical Report 58 by Peat, Marwick and Mitchell & Co. Table 37. Processed weight is assumed to be 35 percent of the landed round weight.

<sup>b</sup>Assumed constant throughout forecast period.

<sup>c</sup>From SCIMP 163.

<sup>d</sup>Louis Berger & Associates, Inc.; Using 35 percent conversion factor which is the same as used in Technical Report 60, by E.R. Combs, 1981.

Source: Louis Berger & Associates, Inc.



The small boat harbor (see Figure 26) at St. Paul is expected to aid in the development of the island's economy; however, it will also serve as a base to resupply fishing vessels. These two factors will result in increased traffic to and from St. Paul. The project feasibility study has been completed by the Corps of Engineers and the State of Alaska has shown an interest in this project. For these reasons, it has been assumed that the small harbor will be constructed by the end of 1985/86 based on discussions with DOT/PF. The full operation of the port by a fishing fleet is expected to occur in 1989.

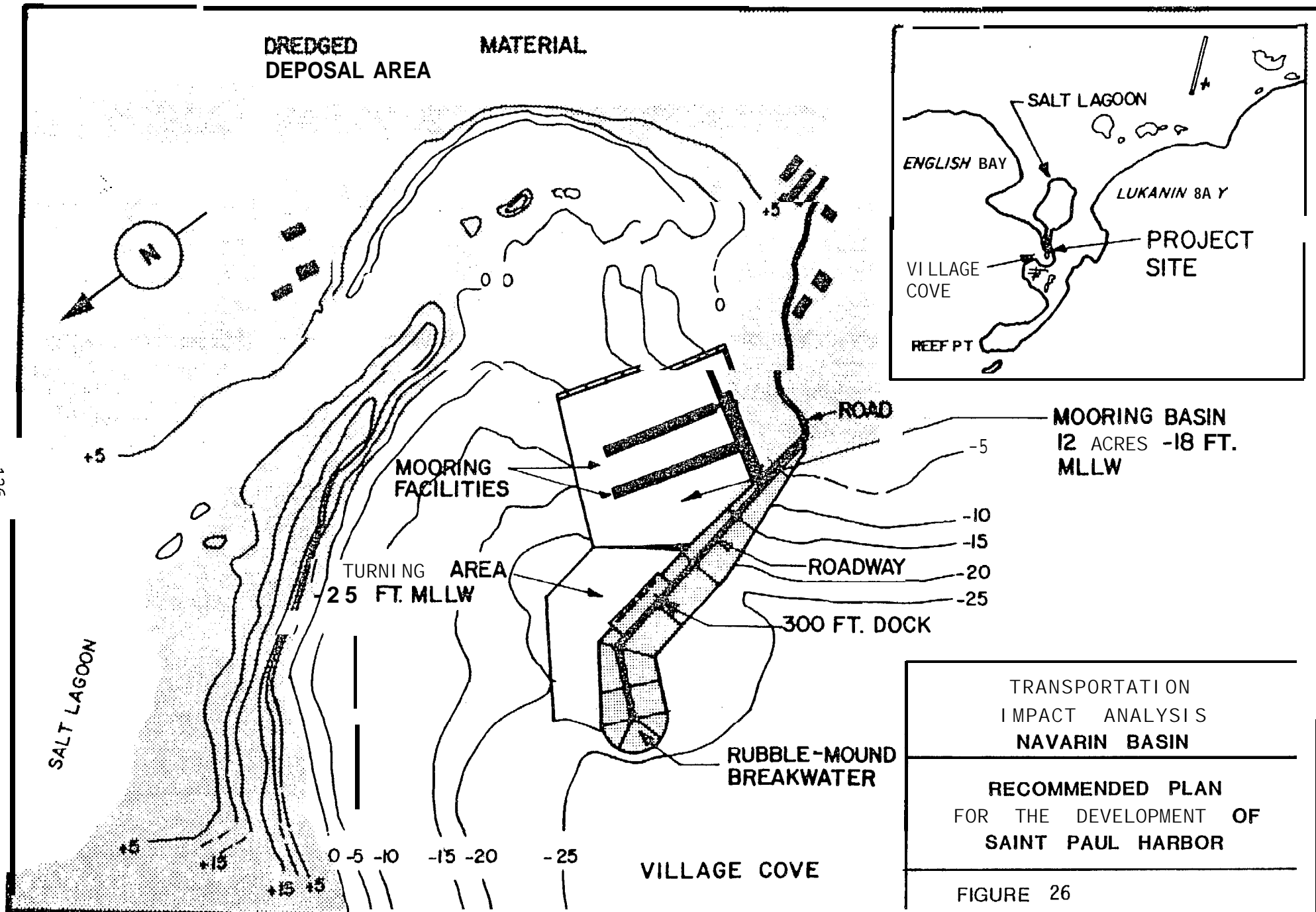
## MARINE FORECASTS

### Unalaska - Dutch Harbor

Petroleum Products. Unalaska-Dutch Harbor serves as a center for the distribution of petroleum products to the Aleutians, to Northern and Western Alaska, and to communities on the Alaska Peninsula. Although Unalaska-Dutch Harbor is the principal source of their bulk fuel supplies, private charters from the Lower 48 States are often arranged for large shipments to a single location or customer. The Western and Arctic Alaska Transportation study (WAATS, Louis Berger & Associates, Inc., 1982), reported that about 66 percent of the fuel requirements of that region came from Unalaska-Dutch Harbor. This conclusion was based upon a detailed analysis of 1977 data. Variations in year-to-year sales to this region are due to weather conditions, the level of construction activity, and year-end inventories. In the Bristol Bay and Unalaska-Dutch Harbor region, a major use of petroleum products is associated with the fishing industry: fishing boats and processors, both foreign and domestic. Discussions with Chevron indicate that the year-to-year variations in the sales associated with this industry are due to biological and market conditions and are not easily predicted.

Historic data collected in the chapter on Baseline Conditions give an indication of these compounding effects of the variation in annual shipments of inbound and outbound cargoes. A cross-check between the U.S. Army Corps of Engineer data and Chevron sales data was not possible.

The outbound forecasts are based to a large extent on historic data and studies which were completed earlier. Outbound shipments of petroleum products from Unalaska-Dutch Harbor are



Source: Final Harbor Feasibility Study St. Paul Island, Alaska. U.S. Army Corps of Engineers, 1982.

for the purposes of this study comprised of four categories: 1) destinations in Northern and Western Alaska, 2) destinations in the Alaska Peninsula and Aleutian Islands, 3) the Pribilof Islands, and 4) shipments to the oil and gas industry associated with the exploration phase resulting from the St. George Lease Sales, 70.

The forecasts of petroleum product shipments to Western and Northern Alaska are taken from the WAATS reports and are summarized in Table 31 in five-year increments to the year 2000. The portion of these shipments originating from Unalaska-Dutch Harbor is assumed to remain at 66 percent of the total over the forecast period, although this will vary due to competition and to charters. Large variations in year-to-year shipments are due to changing levels of construction, to inventories left over at year end, and to shipments by charters. The 1981 movement is estimated to be the average of the 1978 through 1981 shipments to this region. This value is 82,000 tons.

The magnitude of the shipments of petroleum products to destinations in the Bristol Bay, Aleutian Islands, and the Alaska Peninsula is dependent on the fishing industry, which is energy intensive. The data available do not distinguish between consumption for this industry and for other purposes. The growth in the use of fuel will depend to a large extent on the future of this industry. The growth of the traditional fishing industry is expected to be relatively small, but the bottomfishing industry is presently in its infancy. The best economic parameter which, over time, measures the combined growth of these two industries is the growth in the number of employees associated with these industries.

Using data provided from the SCIMP 162, the 1981 total processing enclave employment (TFPNREMP), the number total nonresident fishermen (TONRFISH) and the resident employment associated with these industries (variables EMPRV, EMPRON, TRFHEMP and TRFPEMP)<sup>a</sup> is 2,725 persons in 1981, and by the year 2000, this employment will increase to 8,622 persons. This growth is equivalent to an annual rate of 6.2 percent over the 19

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<sup>a</sup>EMPRV = Resident Bottom Fishermen; EMPRON = BottomFish Processing Resident Employment; TRFHEMP = Traditional Resident Employment; TRFPEMP = Traditional Processing Resident Employment.

TABLE 31

PETROLEUM PRODUCT SHIPMENTS FROM UNALASKA-  
DUTCH HARBOR TO WESTERN AND NORTHWESTERN ALASKA

	<u>1977</u>	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>
Bethel <sup>a</sup>	38,776	44,247	51,450	56,595	60,428
Bering Sea and Northern Alaska	17,793	129,440	170,002	171,353	186,753
TOTAL	111,569	173,687	221,452	227,948	247,181
From Dutch Harbor	73,635	114,633	146,158	150,446	163,139

<sup>a</sup>These values assume all fuel shipments to Calista Region are redistributed through Bethel.

Source: Louis Berger and Associates, Inc., WAATS, 1982, Phase II, Volume I Table 2.4.3-1 and Phase III Volume III Table 4.2-20.

year period. Similar **SCIMP** data on the expected growth of the fishing industry in the Bristol Bay census district are not available; however, the existing fish processing plants and resident and nonresident fishermen in that region are expected to take advantage of the growth in the **bottomfish** industry in a way which is similar to what was projected for the Aleutian-Pribilof census region.

Although most of the growth in fuel consumption will be due to the bottomfish industry, as this industry expands, it will become more efficient as economies of scale occur. Consequently, the actual consumption of fuel per person employed in the industry should decrease; similarly, increased energy efficiency and fuel substitution in all sectors of the economy should **result** in the long run in lower per capita rates of fuel use. This **should** result in a lower growth rate for fuel consumption than the 6.2 percent indicated from the above data. A value of 81 percent seems reasonable in light of the existing fish processing infrastructure already installed in the area and for other reasons given above (a 10 percent reduction for energy efficiency and a 10 percent reduction due to the economics of scale).

The 1981 movement is estimated to be the average of the 1978 through 1980 shipments to this area. The large variations in year-to-year values are due to the factors discussed above and probably obscures any **longterm** trends. This value is 57,000 tons.

Finally, fuel shipments associated with the St. George lease sale 70 - exploration phase - are taken from Technical Report 58 (Peat, Marwick, Mitchell & Co., 1981).

Local consumption based upon historic data is:

1978	93,058 tons
1979	98,650 tons
1980	56,754 tons
Average for 3 -years:	82,820 tons <sup>a</sup>

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<sup>a</sup>No information is available to indicate why the 1980 tonnage dropped. An average is taken since it is the best available indicator of the longer term trend. See discussion of petroleum shipments to Unalaska/Dutch Harbor in Chapter III.

The annual variation in local consumption is quite large due, in part, to changing conditions in the fishing industry and to the complex nature of the market, i.e., unreported direct charters to consumers and to possible reporting errors in the basic data. Long-term trends cannot be determined from this data. The local consumption of petroleum products includes supplying a number of fishing boats operating from Unalaska-Dutch Harbor with fuel and providing at least eight fish processors in Unalaska-Dutch Harbor with their fuel requirements as well as those of the local residents and the service industry. Data on the fuel consumed by service sector and the residents of this community are not known.

Based upon data collected in WAATS (Louis Berger and Associates, Inc., 1982) per capita consumption (these values include public institutions as schools) of petroleum products varied considerably, from 1 to 5 tons, depending on the type of community - regional hub to remote village. Even if a high value of 5 tons per capita is used, the non-industrial consumption by residents would be in the order of magnitude of 7,200 tons per year in 1981. The best indicator of the growth in fuel consumption in the community is the growth of its population which also accounts for the growth in the fishing industry and other sectors of the local economy: this figure is 6 percent per year. Fuel consumption, expected to grow at a lower rate due to conservation, is estimated to be 5.4 percent.

According to Chevron, the principal supplier of petroleum products to the region, certain processors contract their fuel requirements directly from the lower 48 states. These shipments are made directly to Unalaska-Dutch Harbor. Similarly, not all fish boats are supplied directly by Chevron; in some cases, the fish processors supply fuel directly to the fish boats. Thus, even if Chevron sales data were available, the portion allocated to processors and fish boats would be obscured. Thus, the industry as a whole must be analyzed, and the best indicator of long term trends in this industry is the growth of non-resident enclave population which is growing at 7 percent per year over the forecast period. Due to economies of scale and fuel conservation, the growth of fuel used by this industry will be lowered to 81 percent of this value or a 5.7 percent growth in fuel consumption. The 1981 consumption is estimated to be 75,600 tons (82,800 tons less 7,200 tons).

The forecast of throughput tonnages of petroleum products is summarized in Table 32.

Dry Cargo. A detailed analysis of the dry goods flows through Unalaska-Dutch Harbor shows that these are comprised of (a) inbound goods; namely, products associated with the processing of fish (i.e., chemicals, paper, etc.); construction materials and equipment associated with public projects and the maintenance of the processing plants; and miscellaneous items; and (b) outbound cargoes, principally fish and food products. Although there are not enough data for a statistical analysis, there seems to be a relationship between inbound dry cargoes and the outbound food products (Table 33). A ratio of 1 to 3 between inbound and outbound cargo seems to exist. Table 34 shows the outbound fish products in 1981 to be 30,000 tons. To this figure must be added food products which includes by-products of the fish processing industry. Historic data for outbound food products are:

1978	4,815 tons
1979	18,441 tons
1980	15,867 tons
Average for 3 years:	13,041 tons

The very high 1979 outbound tonnage reflects a good fishing year and probably skews the year average. Probably a more realistic average value would be 10,000 tons. The 1981 tonnage of fish and food products would then be 40,000 tons, about 10 percent higher than the 36,044 tons in 1980, which was a poor year for certain fisheries.

Outbound general cargoes other than fish and food products averaged 1,932 tons per year over the last 3 years:

1978	2,019 tons
1979	1,196 tons
1980	2,582 tons
Average for 3 years:	1,932 tons

TABLE 32

## FORECAST OF PETROLEUM PRODUCTS SHIPMENTS FOR UNALASKA-DUTCH HARBOR

BASE CASE - NAVARIN BASIN LEASE SALE

(1,000 TONS)

e	YEAR	INBOUND	LOCAL CONSUMPTION			OUTBOUND					TOTAL THROUGHPUT
			FISH INDUSTRY	OCS LOCAL CONSUMPTION	TOTAL	NORTH/WESTERN ALASKA	ALEUTIANS/BRISTOL BAY AK. PEN.	PRIIBILOFS	OCS ST. GEORGE	TOTAL	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1981	225.5	7.2	75.6		82.8	81.8	56.5	3.5		142.7	368.2
1982	229.3	7.6	79.9		87.5	89.0	59.3	3.5		151.8	381.1
1983	260.7	8.0	84.5	3.0	95.5	96.8	62.3	3.6	2.5	165.2	425.9
1984	280.1	8.4	89.3	4.0	101.7	105.3	65.4	3.6	4.1	178.4	458.5
1985	299.6	8.9	94.4	4.5	107.8	114.6	68.7	3.6	4.9	191.8	491.4
1986	313.3	9.4	99.7	4.0	113.1	120.3	72.1	3.7	4.1	200.2	513.5
1987	324.7	9.9	105.4	2.1	117.4	126.3	75.7	3.7	1.6	207.3	532.0
1988	337.1	10.4	111.4		121.8	132.6	79.5	3.8		215.9	553.6
1989	355.3	11.0	117.8		128.8	139.2	83.5	3.8		226.5	581.8
1990	373.8	11.6	124.5		136.1	146.2	87.7	3.8		237.7	611.5
1991	386.7	12.2	131.6		143.8	147.0	92.0	3.9		242.9	629.6
1992	400.3	12.8	139.1		151.9	147.9	96.6	3.9		248.4	648.7
1993	414.6	13.5	147.0		160.5	148.7	101.5	3.9		254.1	668.7
1994	429.8	14.3	155.4		169.7	149.6	106.5	4.0		260.1	689.9
1995	445.6	15.0	164.3		179.3	150.4	111.9	4.0		266.3	711.9
1996	463.9	15.8	173.6		189.4	152.9	117.5	4.1		274.5	738.4
1997	483.0	16.7	183.5		200.2	155.4	123.3	4.1		282.8	765.8
1998	503.1	17.6	194.0		211.6	157.9	129.5	4.1		291.5	794.6
1999	505.8	18.6	205.1		223.7	160.5	136.0	4.2		300.7	806.5
2000	546.4	19.6	216.7		236.3	163.1	142.8	4.2		310.1	856.5

(1) Sum of (5) + (9).

(2) 5.4% growth, see text.

(3) 5.7% growth, see text.

(4) Technical Report 58, Table 52 - Exploration phase only.

(5) Sum of (2) + (3) + (4).

(6) WAATS, see text.

(7) 5.0 growth, see text.

(8) Growth 1.0 percent.

(9) Technical Report 58, Table 52.

(10) Sum of (6) + (7) + (8) + (9).

(11) Sum of (1) + (10).

Source: Louis Berger and Associates, Inc.

TABLE 33

SUMMARY OF DRY CARGO FLOWS UNALASKA-DUTCH HARBOR  
(TONS)

<u>YEAR</u>	I NBOUND	I NBOUND	I NBOUND	OUTBOUND	RATI O	
	<u>TOTAL</u>	<u>F I S H</u>	<u>LESS F I S H</u>	<u>F I S H AND</u> <u>FOOD PRODUCTS</u>	<u>(4):(1)</u>	<u>(3):(1)</u>
	<b>(1)</b>	(2)	(3)	<b>(4)</b>	-	
1978	11, 258	1, 054	10, 204	32, 090	2. 85	3. 14
1979	20, 760	1, 472	19, 288	58, 004	2. 79	3. 01
1980	14, 328	1, 753	12, 573	36, 044	2. 51	2. 87

Source: Chapter II, Louis Berger and Associates, Inc.

TABLE 34

## FORECAST OF DRY CARGO SHIPMENTS FOR UNALASKA-DUTCH HARBOR

BASE CASE - NAVARIN BASIN LEASE SALE

( 1,000 TONS)

YEAR	OUTBOUND CARGO			OCS ST. GEORGE	OTHER GENERAL	TOTAL	INBOUND CARGO			THROUGHPUT
	FISH	FOOD	TOTAL				Ocs			
	PRODUCTS	PRODUCTS	FISH & FOOD				GENERAL	ST. GEORGE	TOTAL	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1981	30.0	10.0	40.0		2.0	42.0	13.3		13.3	55.3
1982	30.5	10.6	41.1		2.1	43.2	13.7		13.7	56.9
1983	30.8	11.2	42.0	3.8	2.2	48.0	14.0	5.2	19.2	67.2
1984	31.2	11.9	43.1	6.3	2.3	51.7	14.4	8.5	22.9	74.6
1985	31.7	12.6	44.2	7.6	2.4	54.0	14.8	10.1	24.9	78.9
1986	32.2	13.4	45.6	6.3	2.6	54.5	15.2	6.5	21.7	76.2
1987	32.7	14.2	46.9	2.5	2.7	52.1	15.6	3.5	19.1	71.2
1988	33.4	15.0	48.4		2.8	51.2	16.1		16.1	67.3
1989	34.2	15.9	50.1		3.0	53.1	16.7		16.7	69.8
1990	35.1	16.9	52.0		3.1	55.1	17.3		17.3	72.4
1991	36.3	17.9	54.2		3.3	57.5	18.1		18.1	75.6
1992	37.9	19.0	56.9		3.4	60.3	14.0		19.0	79.3
1993	39.9	20.1	60.0		3.6	63.6	20.0		20.0	83.6
1994	42.4	21.3	63.7		3.8	67.5	21.2		21.2	88.7
1995	45.7	22.6	68.3		4.0	72.3	22.8		22.8	95.1
1996	50.3	24.0	74.3		4.2	78.5	24.8		24.8	103.3
1997	56.5	25.4	81.9		4.4	86.3	27.3		27.3	113.6
1998	64.6	26.9	91.5		4.6	96.1	30.5		30.5	126.6
1999	75.7	28.5	104.2		4.8	109.0	34.7		34.7	143.7
2000	90.8	30.2	121.0		5.1	126.1	40.3		40.3	166.4

- (1) See Table 30
- (2) Growth of food product 6 percent.
- (3) Sum of (1) + (2).
- (4) Technical Report 58, Table 52.
- (5) 5 percent growth rate.
- (6) Sum of (3) + (4) + (5).
- (7) 1/3 of (3).
- (8) Technical Report 58, Table 52.
- (9) Sum of (7) + (8).
- (10) Sum of (6) + (9).

Source: Louis Berger and Associates, Inc.

The 1981 value of 2,000 reflects a growth rate of 5 percent per year. OCS shipments connected with the exploration phase of the St. George Basin Lease Sale, 70, were obtained from Technical Report 58 (Peat, Marwick, Mitchell and Co., 1981).

Fresh water is needed to drill the off-shore wells required during the exploration phase of the development of the St. George Basin. Estimates of these shipments from Unalaska-Dutch Harbor in thousand tons were taken from Technical Report 58 (Peat, Marwick, Mitchell and Co., 1981).

1983	14.4
1984	24.0
1985	28.8
1986	24.0
1987	9.6

### Cold Bay

The forecast of petroleum product movements through Cold Bay is a function of the air traffic using the airport. Air operations are the best indication of the increase in demand for petroleum products. Based upon the estimated air operations of 3,270 for 1980 (see Table 35) and the 3,602 tons of fuel shipped to Cold Bay in that year, the average consumption of fuel per operation is 1.1 tons. This factor is assumed to be constant over a 20 year period. The forecasts consider OCS helicopter operations resulting from the St. George lease sale exploration phase.<sup>a</sup>

Dry cargoes are expected to increase in direct proportion to the population; however, year-to-year variations could be 2 to 3 times the value given here. Large increases in throughput can

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<sup>a</sup>The resulting values are higher than those in Technical Report Number 58( Peat, Marwick, Mitchell & Co., 1981).

TABLE 35

FORECASTS OF PETROLEUM PRODUCTS AND DRY CARGO SHIPMENTS AT COLD BAY

## BASE CASE - NAVARIN BASIN LEASE SALE

( T O N S )

	<u>PETROLEUM PRODUCTS</u>	<u>DRY CARGO<sup>a</sup></u>	<u>DRY CARGO OCS ST. GEORGE</u>	<u>TOTAL DRY CARGO</u>
1981	3, 795	800		800
1982	3, 993	828		828
1983	7, 425	857	250	1, 107
1984	7, 645	887	388	1, 275
1985	7, 887	918	460	<b>1,378</b>
1986	8, 151	950	391	1, 341
1987	<b>8,415</b>	1, 983	153	1, 136
1988	5, 500	1, 018		<b>1,018</b>
1989	5, 797	1, 053		1, 053
1990	6, 116	1, 090		1, 090
1991	6, 446	1, 128		1, 128
1992	6, 816	1, 168		1, 168
1993	7, 183	1, 209		1, 209
1994	7, 579	1, 251		1, 251
1995	5, 805	1, 295		1, 295
1996	6, 138	1, 340		1, 340
1997	6, 479	1, 387		<b>1,387</b>
<b>1998</b>	6, 853	1, 486		1, 436
1999	7, 238	1, 486		1, 486
2000	7, 656	1, 538		1, 538

<sup>a</sup>Increasing at 3.5 % per year.

Source: Louis Berger & Associates, Inc.

result from (a) construction programs funded by the state, where the port facilities at Cold Bay are used as a staging base or (b) construction activity due to a project in Cold Bay. OCS dry cargoes from the exploration phase of the St. George lease sale are added to the total dry cargoes.

#### St. Paul

The forecasts of both petroleum products and dry goods are expected to increase with the growth in resident population for the period 1981 through 1989. Because of the new port facilities, fishing boats are expected to take on supplies and crews at St. Paul after 1989. It is estimated that 100 tons of fuel<sup>a</sup> and 5 tons of foods and other products will be taken on by each boat over the course of a fishing season. Table 36 summarizes the throughput of cargo at St. Paul.

#### Analysis of the Marine Transportation System Capacity

The primary consideration in the analysis of the marine transportation system capacity is the land side facilities, i.e., port and storage capacities. The shipping industry can easily expand its capacity by putting more ships, tugs and barges into the western Alaska trade. In global and national terms, the quantities of goods shipped are small and would not, even if expanded, act to constrain the industry. In addition, the technology presently in use is expected to change appreciably over the forecast period.

There are several methods for determining port capacity. The capacity of a port is defined as the cargo throughputs that a port is capable of handling per unit of time. Generally, the ship-to-berth throughput capacity is the principal constraint that limits a port's capacity; however, other constraints can

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<sup>a</sup>100 days at 300 gallons per day x 7 pounds per gallon = 105 tons, say 100 tons.

TABLE 36

FORECASTS OF PETROLEUM PRODUCTS AND DRY CARGO SHIPMENTS AT ST. PAUL

BASE CASE - NAVARIN BASIN LEASE SALE

(TONS)

	PETROLEUM PRODUCTS			DRY PRODUCTS		
	LOCAL			LOCAL		
	CONSUMPTION	FISHING	THROUGHPUT	CONSUMPTION	FISHING	THROUGHPUT
	(a)	(b)	(c)	(d)	(e)	(f)
1981	2,650		2,650	850		850
1982	2,677		2,677	859		859
1983	2,703		2,703	867		867
1984	2,730		2,730	876		876
1985	2,758		2,758	885		885
1986	2,785		2,785	893		893
1987	2,813		2,813	902		902
1988	2,841		2,841	911		911
1989	2,870		2,870	920		920
1990	2,898	2,000	2,898	930	100	1,130
1991	2,927	2,100	7,127	939	105	1,149
1992	2,957	2,205	7,367	948	110	1,168
1993	2,986	2,315	7,616	958	116	1,190
1994	3,016	2,431	7,878	967	122	1,211
1995	3,046	2,553	8,152	977	128	1,233
1996	3,077	2,680	8,437	987	134	
1997	3,107	2,814	8,735	997	141	
1998	3,138	2,955	9,048	1,007	148	
1999	3,170	3,103	9,376	1,017	155	
2000	3,202	3,258	9,817	1,027	163	

<sup>a</sup>Growth factor of 1.01.<sup>b</sup>1990 100 tons per boat X 20 boats = 2,000; increasing thereafter at 5 percent per annual.<sup>c</sup>Sum of a + 2b.<sup>d</sup>Growth factor of 1.01.<sup>e</sup>1990 100 tons; increasing thereafter at 5 percent per year.<sup>f</sup>Sum of d + 2e.

Source: Louis Berger &amp; Associates, Inc.

occur anywhere in the port's cargo handling system. Storage area, access gates, or work rules, etc., can be a limiting factor on a facility's throughput. Most methods of analyzing port capacity concentrate on the ship-to-berth relationship because this is usually the limiting factor. There are two aspects that limit ship-to-berth-throughput: 1) the cargo handling rate; i.e., the rate at which cargo is loaded or unloaded, which is a function of the cargo handling technology, and 2) the acceptable waiting time for a ship to be serviced due to the berth occupancy. As the berth is used and its occupancy increases, there is an increased chance that a ship will have to wait.

## CARGO HANDLING TECHNOLOGY

The rate of loading or unloading of cargo, either at the berth or at the storage areas of the port, depends upon cargo handling technology as well as the operating procedures in a port. To simplify port operations analysis, cargo handling technologies are classified as follows:

- General cargo: This category is a mixture of types of cargoes in different sized containers; it has the lowest cargo handling rates since it is labor intensive.
- Containerized: Cargo is transported in containers of various sizes. (Containers of different sizes are converted into 20 foot equivalent unit containers (TEU's) for planning purposes. Containers are loaded or unloaded on container ships by special container cranes or by ship's equipment. Containers require considerable storage area behind the berth.
- **Roll-on/Roll-off:** Cargo is transported in containers or semi-trailers or on a wheeled vehicle that can be rolled on and off the vessel. This method of shipment can have a high cargo handling rate and usually requires a dedicated berth. "
- Break bulk: A single type of general cargo is prepackaged, i.e., **prepalletized**, strapped, etc., into standard unit loads prior to its being loaded onto the ship. In this way, less labor is required in

manipulating it at the port and higher handling rates can be achieved. Breakbulk includes prepackaged goods, lumber, logs, reinforcing steel, etc.

- Dry bulk: This type of cargo is transported and loaded or unloaded by conveyors or bulk handling equipment. Dry bulk include ore, grain, sugar, fertilizer, etc. This method has the highest cargo handling rate for dry cargo.
- Liquid bulk: This type of cargo is transported and unloaded by pumping the liquid through a pipeline. This method has the highest cargo handling rates.

## BERTH CAPACITY

The methodology for estimating the capacity of a cargo handling terminal is derived from the "NORCAL" method developed for the U.S. Maritime Administration (Manalylics, Inc., February 1976) and was adopted for Alaskan conditions in 'he 'eStern and Arctic Alaska Transportation study (WAATS; Louis Berger and Associates, Inc., 1982). It is described previously in Chapter II.

$$C = \frac{N p_1 p_2 p_3 \sqrt[4]{t_1 t_2} R p}{p_0} \quad (1)$$

where: C = throughput capacity in tons, boxes, or units per unit of time

N = total number of berths, gangs, pieces of equipment, or storage area

$p_0$  = peak demand factor ratio of peak flow to average flow

$p_1$  = maximum facility utilization given acceptable delays

$p_2$  = Fraction of scheduled non-operating time;

$t_1$  = operating hours/day

$t_2$  = operating days/month (or year)

R = Rated cycle time in units per time period.

D = Cargo density in tons/units

(See Chapter II for more details on the definitions of these variables. :

## BERTH UTILIZATION ( $P_1$ )

In order to determine the terminal and, therefore, the port capacity, it is essential to completely understand an important element in the port system: berth utilization. If ships arrived at port with complete regularity and if the time taken to load and unload them were constant, it would be a simple matter to determine the throughput capacity of a terminal as given by Equation 1. Unfortunately, such an ideal situation never exists in reality. Ships arrive at a port on a random basis. Also the time required to load and unload a vessel varies substantially due to a number of factors -not only because of the different quantities and types of cargo which are handled, but also because a variety of other considerations which affect the cargo handling rate. Consequently, the effects of two factors (variable ship arrival rate and time needed for cargo handling) imply that in order to achieve a berth occupancy of 100 percent, long queues are needed to ensure that a ship can have immediate occupancy of a berth. In practice, these two factors are balanced by economic considerations, e.g., the cost of providing additional infrastructure and the cost of keeping a ship waiting to be berthed.

Although the relationship between berth occupancy and ship waiting time is complex, it is analyzed by a mathematical technique which is called queuing theory. This is described mathematically as the relationship between berth occupancy and the ratio of the queuing time (waiting time) to service time ( $T_q/T_s$ ). The average time a ship spends at berth (berth service time) includes loading and unloading cargo, berthing/deberthing, and documentation. Table 37 gives this relationship between berth occupancy, number of berths, and the ratio of queuing time to berth service time. As pointed out above, economics dictate permissible berth occupancy rates, but the parameter which gives the best indication of these economic considerations is the queuing to service time ratio. Since the non-productive costs (costs only) to the shipowner are best indicated by the ship waiting time, and the cost to the port (owner of the infrastructure) is the berth service time and berth occupancy, values between 0.10 and 0.25 for the queuing to service time ratio represents acceptable ratios for most ports (Alaska Consultants, Inc., 1981).

TABLE 37

PERCENTAGE BERTH OCCUPANCY

<u>NUMBER OF BERTHS (N)</u>	<u><math>T_q = 0.10</math></u> <u>' B</u>	<u><math>T_q = 0.25</math></u> <u>' B</u>
1	12%	25%
2	35	50
3	48	62
4	56	68
5	62	73
6	66	77
8	72	81
10	76	84
12	79	86
14	81	88
16	83	89
20	85	93

---

$T_q$  = Berth Queuing Time

$T_B$  = Berth Service Time

Source: Planning Criteria for U.S. Port Development, U.S. Department of Commerce, Maritime Administration. (Alaska Consultants Inc., 1981)

## PORT CAPACITY AT **UNALASKA-DUTCH** HARBOR

### Calculation

In **Unalaska-Dutch** Harbor, there are four cargo terminals described in the chapter on baseline conditions. Since each of these facilities are operated separately for the purposes of this analysis, they are considered as four separate terminals. This implies that a ship which plans to load cargo at the APL terminal cannot be diverted to the City Dock to load its cargo when the APL terminal is busy and the City Dock is not. Table 38 summarizes the operating parameters used for each facility at **Unalaska-Dutch** Harbor. The following gives an explanation of the values used in this table:<sup>a</sup>

- Number of berths (N): The addition to the City Dock will make it a two berth facility. The Chevron fuel dock can load a number of fishing vessels at a time; four berths are used in this analysis.
- Peak demand factor ( $P_o$ ): This is the ratio of peak flow to average flow, and for **Unalaska-Dutch** Harbor this is important since distinct peaks do occur. Based on discussions with operators, the peak demand factor varies in June to July and October through December from 1.5 to 4.0 times the average. A detailed month-by-month or week-by-week-analysis of the flows would be required, however, to arrive at a precise answer which is still likely to vary from year-to-year. A value of 2 is used in this preliminary analysis.<sup>b</sup> At the Chevron facility

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<sup>a</sup>The Crowely facility (Captain's Bay Tank Farm) does not presently operate as a commercial facility; however, if demand warranted it could be used as one or leased out for use by OCS oil and gas companies.

<sup>b</sup>Two (2) is used for lack of other more precise information. This value would not represent the maximum peak which might only last for several days and which is probably represented by the value 4. The value 2 might be considered the "design peak", e.g., this would be the traffic level for which an **engineer** might design certain aspects of the facility.

TABLE 38

SUMMARY OF THE PORT OPERATING PARAMETERS AND FACILITY THROUGHPUT FOR **UNALASKA-DUTCH** HARBOR

TERMINAL:			CHEVRON	<b>CROWLEY</b>	CITY DOCK	APL	CHEVRON
TECHNOLOGY:	CITY DOCK	APL	LIQUID	BREAK	BREAK	BREAK	RETAIL
	<u>CONTAINER</u>	<u>CONTAINER</u>	<u>BULK</u>	<u>BULK</u>	<u>BULK</u>	<u>BULK</u>	<u>SALES</u>
Number of berths (N):	2	1	1	1	2	1	4
Peak demand factor ( $P_o$ ):	2	2	1	2	2	2	2
Scheduled non-operating time factor ( $P_2$ ):	0.78	0.90	0.90	0.90	0.78	0.90	0.90
Unscheduled delay factor ( $P_3$ ):	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Operating allowance factor ( $P_4$ ):	1	1	1	1	1	1	.7
Operating hours per day ( $t_1$ ):	16	9	24 <sup>a</sup>	16	16	9	9 <sup>a</sup>
Operating days per month ( $t_2$ ):	30	22	26	26	30	22	26
Cycle time-units per time (R):	container	container	20,000 tons	5 ton units	5 ton units	5 ton units	tons
per hour:	7	15	72 hours	7	7	7	15
Cargo density in tons/unit (P):	7.5 <sup>b</sup>	9 <sup>b</sup>	1	5	5	5	1
Present maximum facility utilization without peak (1,000 tons) ( $P_1 = 1.$ )	448	274	1,778	129	345	152	168
Berth utilization:							
$T_q/T_b = 0.1$	0.35	0.12	0.12	0.35	0.12	0.12	0.56
Berth utilization:							
$T_q/T_b = 0.25$	0.50	0.25	0.25	0.25	0.50	0.25	0.68

TABLE 38 (CONT.)

Present throughput:

$Tq/Ts = 0.1$  threshold

(1,000 tons)	78	16	213	<b>8</b>	60	9	215
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$Tq/Ts = 0.25$  maximum

(1,000 tons)	112	34	444	16	86	19	565
--------------	-----	----	-----	----	----	----	-----

Possible improved productivity  
with 24 hr/day throughput):

$Tq/Ts = 0.1$  threshold

(1,000 tons)	<b>118</b>	44	213	12	90	24	573
--------------	------------	----	-----	----	----	----	-----

$Tq/Ts = 0.25$  maximum

(1,000 tons)	168	91	444	24	129	51	<b>1,506</b>
--------------	-----	----	-----	----	-----	----	--------------

<sup>a</sup>Only for unloading bulk fuel; retail sales are based on a 9 hour day.

<sup>b</sup>Containers must be handled twice. This value assumes an average of an inbound load of 0 tons and outbound load of 18 tons.

Source: Louis Berger & Associates, Inc.

the large storage capacity of the tank farm reduces the impact of peak demand while the general lack of dry storage space at Unalaska-Dutch Harbor tends to magnify this problem.

- Maximum facility utilization ( $p_1$ ): This is the berth occupancy factor discussed above.
- Scheduled operating time factor ( $P^*$ ): Based on discussions with Sealand, a value of 0.78 is calculated. A value of 0.90 is used elsewhere.
- Unscheduled delay factor ( $P_3$ ): This measures the impact of delays due to poor weather; a factor of 0.95 is used throughout based on discussions with operators.
- operating allowance factor ( $P_4$ ): A value of 1.0 is used for all facilities. This is probably an optimistic assessment since much of the storage area is offsite. The requirement of hauling the containers to and from the berth reduces the productivity of the berth.
- operating hours per day ( $t_1$ ): This is based upon discussions with the terminal operators; however, this value is increased during peak periods. This effect is analyzed separately.
- Cycle time ( $t_2$ ): These values are based upon discussions with the operators. These rates are much lower than found elsewhere.
- Cargo density ( $P$ ): This is based on data provided by the operators. The average density for containers (9 tons per lift) is probably conservative.

The peaking factor of 2 reduces the throughput by 50 percent since the facility must be able to handle the peak demands. If the peaks can be spread over a longer period of time, the peaking factor would then be reduced and the throughput of the facility would increase proportionally.

The dry cargo facilities (City Dock and APL terminal) can load\ unload containers as well as break bulk cargo. The throughput of breakbulk cargoes is considerably lower than that of the containers.

At the Chevron facility, even while the incoming petroleum products are lightered it is possible to use this facility for fueling fishing boats (four berths). The sum of the incoming and the outgoing tonnages is a good estimate of the throughput of the present facility. If there were enough lighter and storage capacity, it would be possible to unload two tankers at once with some reduction in efficiency. This in effect would make it a two berth facility for incoming cargo. This possibility is not considered.

The results of the analysis of throughput capacity for Unalaska-Dutch Harbor are shown in Table 38 and summarized in Table 39.:

TABLE 39

SUMMARY OF THE THROUGHPUT CAPABILITY OF UNALASKA-DUTCH HARBOR

	DRY CARGO		LIQUID BULK/SALES	
	<u>PRESENT</u>	<u>IMPROVED</u>	<u>PRESENT</u>	<u>IMPROVED</u>
$T_q/T_s = 0.1$	102	174	428	786
$T_q/T_s = 0.25$	162	283	1,009	1,950

Source: Louis Berger & Associates, Inc.

The lower queuing to service time ratio ( $T_q/T_s = 0.1$ ) represents the range of threshold values for the capacity of the facility. Congestion is not a major problem, but the ship's waiting time will have to increase in order to allow greater throughput with  $T_q/T_s = 0.1$  increasing to  $T_q/T_s = 0.25$ . At higher values, congestion becomes more of a problem. It is also possible that the greater values for throughput can result from improved operational procedures due to increased productivity of the port. There are several ways which could result in increased productivity: one is to operate the port on a 24 hour basis. The higher values computed in Table 39 reflect this change. Figure 27 compares capacity with the forecast of traffic by year.

Capacity constraints do not occur over the forecast period.

The throughput estimated is lower than the throughput estimates prepared in the Deep Draft Navigation Study (Alaska Consultants, Inc., 1981) which gives the throughput of a container berth as 550,000 tons per year for  $T_q/T_s = 0.25$ . This value is equivalent to the 34,000 tons for the APL facility (see Table 38). The difference in this case is due to: 1) the peak demand factor of 2; 2) low handling rates (1/2 of the potential rate), for instance, with adequate backup area a gantry crane can unload an average of 30 containers per hour; 3) fewer hours per day, and 4) low density average load, i.e., 9 tons. The values in the Deep Draft Navigation Study refer to conventional ports such as Anchorage.

The throughput for dry cargoes could be increased considerably if all four berths were operated as a unit. For instance, with a  $T_q/T_s = 0.1$ , a four berth facility could have an occupancy of 56 percent which would increase the throughput of Unalaska between 1 1/2 and 2 1/2 times over the estimates prepared here. However, the operators would probably find such a change in operational procedures objectionable.

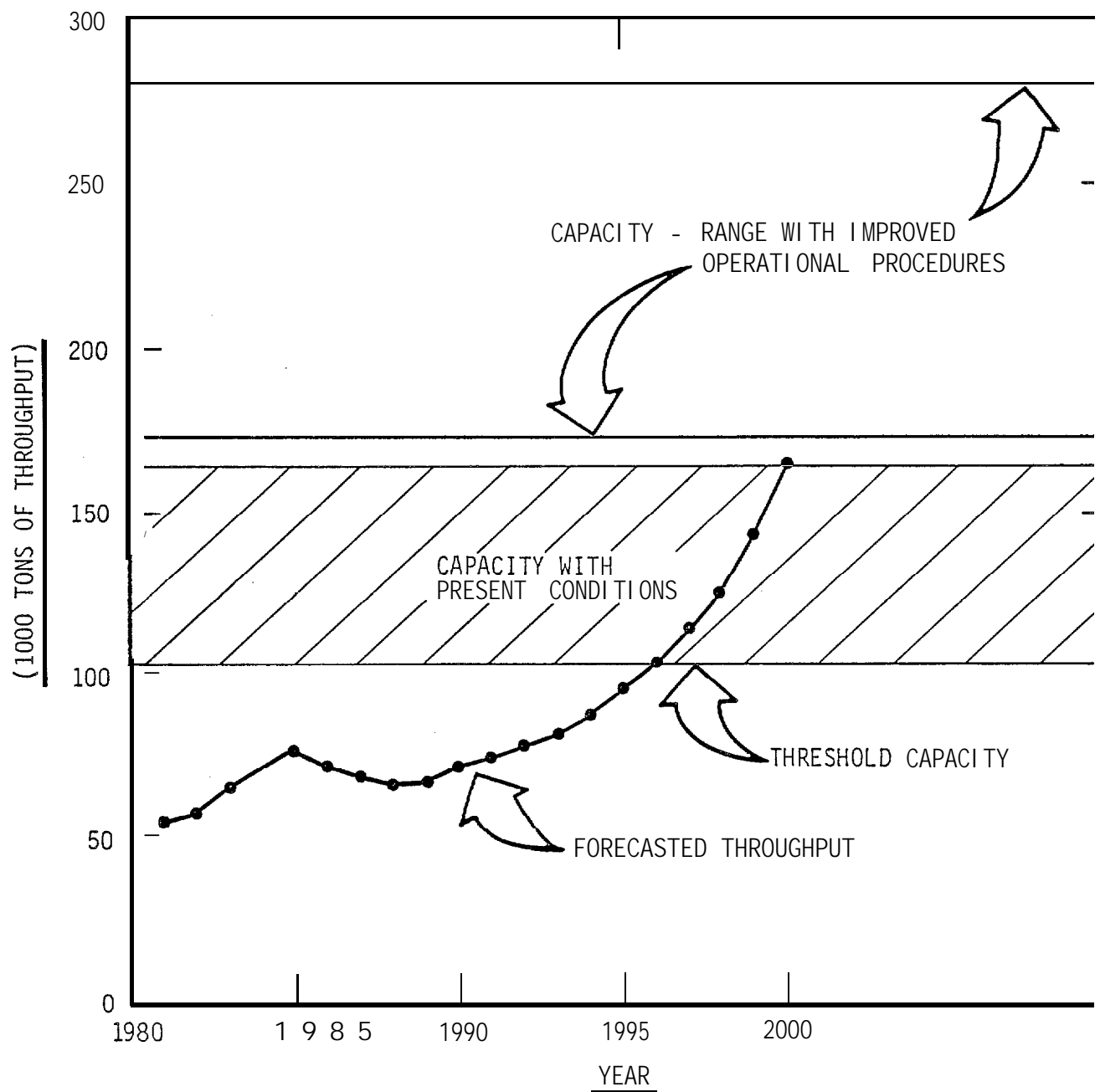
### Evaluation

Figure 27 compares the dry cargo projections with port capacity. Even under the inefficient present operating conditions, the port capacity is sufficient until 1995 with minimal waiting times for the ships. If the waiting time were to increase, the port capacity would be adequate until 1999. However, if there is some improvement in the present operating procedures (a very likely possibility once the threshold capacity is approached), there is more than sufficient capacity to handle the projected tonnages through 2000. If the forecasted tonnages were increased by 20 percent, in 1999 and 2000, the ships' waiting time would begin to increase.

Figure 28 compares petroleum product forecasts with the capacity of the Chevron dock. It is estimated that the threshold capacity will be reached by 1983 after which the ship waiting time will increase. Under present operating conditions, the capacity of the facility will be reached after 1995. With improved operating procedures, however, the capacity of the dock

FIGURE 27

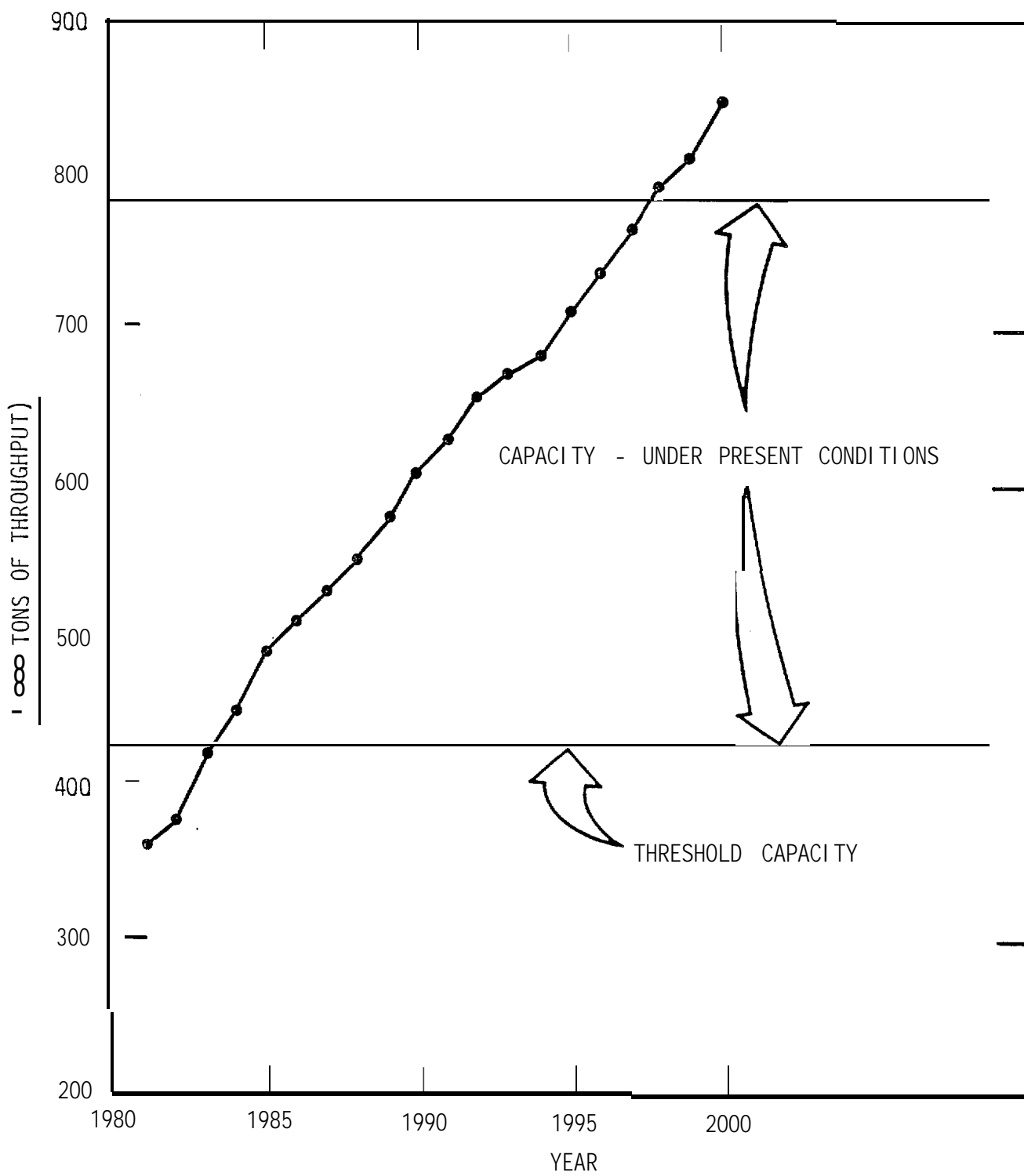
COMPARISON OF PORT CAPACITY AND FORECASTED  
 DRY CARGOES UNALASKA - DUTCH HARBOR  
 -BASE CASE - NAVARIN BASIN LEASE SALE



Source: Louis Berger & Associates, Inc.

FIGURE 28

COMPARISON OF PORT CAPACITY AND FORECASTED PETROLEUM PRODUCTS  
 UNALASKA - DUTCH HARBOR - BASE CASE  
 -NAVARIN BASIN LEASE SALE



Source: Louis Berger & Associates, Inc.

could be increased substantially over the amount of traffic forecasted. Discussions with Chevron indicate it is considering extending the existing jetty so that deep draft ships can be unloaded directly. This would reduce the turnaround time for the ships and increase the throughput of the facility.

## PORT CAPACITY AT COLD BAY

### Calculation

Cold Bay is mainly a petroleum products port and, given its present situation, could be expected to handle a maximum shipment of 15,000 tons per trip to the port if all the present fuel storage capacity were empty. A more reasonable assumption would be to unload a 5,000 ton per shipment. With this size shipment, this facility could handle between 74,000 and 155,000 tons a year which is far in excess of the forecasted traffic.<sup>a</sup>

For dry cargo, the maximum capacity assuming peaking demand factor of 1.0 would be 31,000 to 65,000 thousand tons per year;<sup>b</sup> however, the T-head pier can be used either for unloading petroleum products or dry cargo, but not both at the same time. Therefore, the combined capacity of the facility would be a somewhat lower value than those computed, and the final values would depend upon the mix of these two types of cargoes. Dry cargoes are, however, a relatively small portion of the total and should not interfere substantially with the unloading of fuel products.

### Impact Evaluation

The forecasted traffic can be handled easily at the existing facilities at Cold Bay.

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<sup>a</sup>The Deep Draft Navigation Study (Alaska Consultants, Inc., 1981) estimates that a single berth handling 5,000 ton shipments would have a throughput of 620,000 tons.

<sup>b</sup>This assumes a maximum capacity of 25.

## PORT CAPACITY AT ST. PAUL

### Calculation

The cargo unloaded at this island has to be lighter since the present water depths at the principal docking facility are between 0.9 to 1.2 meters (3 to 4 feet). This severely restricts the size of the vessel that can unload at the dock. The average load carried by the boats lightening cargo is roughly 5 tons. Handling rates will vary, but 200 tons a day for dry goods and 1,000 tons a day for petroleum products, which would be pumped ashore, are estimated. The shipping season is conservatively estimated to be about 270 days because of sea ice, although in some years it could be extended to 310 days. **Since** the large vessel must moor offshore **in** order for the **cargo** to be **lightered**, fog, storms, and bad weather during the shipping season will further reduce this value to an estimated 216 days per year. Using the above rates, approximately 5,000 to 11,000 tons of dry cargo could be handled over the pier assuming there is no period of peak demand or between 26,000 to 54,000 thousand tons of fuel.

Without the development of the bottomfishing industry, forecasted tonnages can be handled by the present facility at St. Paul.

With the construction of the sheltered harbor by 1989, the number of days lost would be appreciably reduced. Furthermore, the shipping season could probably be extended.

With a 91 meter (300 foot) dock, it is estimated that the facility at St. Paul could handle the following tonnages:

TABLE 40

PORT CAPACITY AT ST. PAUL WITH NEW PORT FACILITIES - 1989

0	Dry Cargo	Peak demand = 1.0
	$T_q/T_s = 0.1: C = 1.0 \times .12 \times .78 \times .90 \times 16 \times 310 \times 5 \times 5$	
	= 10,446 tons	
	$T_q/T_s = 0.25: C = 1.0 \times .25 \times .78 \times .90 \times 16 \times 310 \times 5 \times 5$	
	= 21,762 tons	
0	Petroleum (in 2,500 ton shipments)	Peak demand = 1.0
	$T_q/T_s = 0.1: C = 1.0 \times .12 \times .65 \times .90 \times 24 \times 310 \times 275 \times 1$	
	= 143,629 tons	
	$T_q/T_s = 0.25: C = 1.0 \times .25 \times .65 \times .90 \times 24 \times 310 \times 275 \times 1$	
	= 285,417 tons	

Source: Louis Berger & Associates, Inc.

Impact Evaluation

The forecasted traffic can be handled using the existing methods or at the proposed facility.

## STORAGE

Calculation

A major constraint on Unalaska-Dutch Harbor is the lack of an open storage area. Plentiful open storage area is a **requirement** for container cargo. In addition, a portion of the containers are stacked away from the berth rather than directly behind it; thus, the lack of space requires that the container be handled to a greater extent than would be needed in a more conventional arrangement.

About 65 square feet (700 square meters) are required for a TEU stored on a chassis (UNCTAD, 1978). Most of the containers used are 35 or 40 feet in length or approximately 2 TEUs. Using Equation 1, the throughput which can be handled on the total existing storage area (Alaska Consultants, Inc., 1981) of 12 hectares (30 acres) with a 10 day average storage time is:

$$C = \frac{N \times P_1 \times P_2 \times P_3 \times P_4 \times (t_1 \text{ and } t_2) \times R \times P}{E \times 2 \times 65 \text{ m}^2}$$

$$(120,000 \text{ m}^2) \times .91_0 \times 1.0 \times 1.0 \times 1.0 \times 310 \times 1/10 \times 9$$

$$= 116,000 \text{ tons per year.}$$

### Impact Evaluation

This value (116,000 tons) is somewhat optimistic in the short run under present operating procedures. However, in the long run, there is no doubt that between the present and the year 2000 additional storage area could be developed and improved procedures could increase this value. In any case, this value exceeds the sum of in and outbound cargoes over the forecast period except for the period 1995 through 2000.

Thirty six hectares (90 acres) of additional area could possibly be developed for open storage (Alaska Consultants, 1981); this would simply satisfy all cargo storage requirements.

### Aviation Forecasts

#### Forecast Assumptions

Economic activity generates employment which attracts population to an area and provides that population with the necessary means to purchase air transport service. Economic activity is the basis or cause of air traffic demand, as well as the determinant for population.

There are two basic populations utilizing air transport in the study area: transient "enclave" workers, in general those directly or indirectly associated with the fishing industry; and permanent residents. The former come out for the fishing season, while the latter live in the area year round. They are considered to have differing properties to use air service. Both the Aleutian Regional Airport Project Documentation for the City of Unalaska (Dames and Moore, 1982) and the St. George Basin Petroleum Development Scenarios Transportation Systems Analysis for the Alaska Outer Continental Shelf Office (Technical Report No. 58, Peat, Marwick, Mitchell, and Company 1981) indicate that

residents in the area make more use of air travel when in the area than do transients. The results of study by Louis Berger and Associates concur with their findings that transient employees, on the average, embark on somewhat more than four trips per annum in the study area and residents somewhat over five.

Worldwide, there has been a slow, steady, long-run increase in per capita propensity to fly and to utilize air cargo service. This long-run trend has been incorporated in the forecasts presented here. In addition, mail and parcel post and assumed to be a function of population and will increase as population grows.

In the forecast, it is assumed that OCS exploration activity in the St. George Basin will be underway. The transient population is contained in the population predictions, and thus indirect travel demand generated by exploration employees is embodied in the air traffic forecasts. Air plane and helicopter operations to be conducted for the exploration have been included in the operations forecasts. These forecasts of OCS exploration related activity are from St. George Basin Petroleum Development Scenarios Transportation Systems Analysis, Technical Report No. 58, for the Alaska OCS Socioeconomic Studies Program.

#### FUTURE FLEET MIX

The **Electras** of Reeve are likely to be retired by the end of the century, and perhaps by the end of the decade. For veteran aircraft, as time goes on, spare parts and maintenance will become more problematic. **Nearly** all the airports now served by **Electras** could handle jets such as the B-277, B-737, or DC-9. Therefore, one can expect jet service on the Seattle-Cold Bay and Anchorage-Cold Bay routes as well as outside the chain to Adak and Shemya if traffic levels warrant.

When the airport at Unalaska is improved, it is expected that the Anchorage-Unalaska route presently served by smaller twin turboprops will be linked by commercial jets.

#### Unalaska-Dutch Harbor

Air carrier passenger demand at present and in the

foreseeable future, to 1995, is a function of population and employment at Unalaska itself. Given the current route structure of the region, revenue traffic at the airport is tied to Unalaska itself, as air passengers and freight arriving and departing Unalaska are nearly always beginning or ending their trips there. Very little Unalaska air traffic is in transit, as the city does not function as a regional center for the area.

Air taxi revenue traffic and aircraft operations are destined for some of the small communities nearby such as Akutan or Nicholski. Growth in this type of travel is linked to the growth of these villages and the propensity to travel of the inhabitants. However, once the new airport is completed, it seems likely that Unalaska will begin to share with Cold Bay the role of regional center.

It is expected that the recent introduction of twin turbines such as the Metro and F-27 into service to Unalaska portends an important future trend. Thus, the fleet mix operating at Unalaska in the next decade is likely to include a greater proportion of somewhat smaller aircraft. This is counter to the trend worldwide toward the use of larger aircraft. The constraint imposed by the short runway prevents the market from moving to larger airplanes. The YS-11's currently used are the largest aircraft that may use the airport.

As a **result**, air carrier operations can be expected to grow at a faster rate than air carrier revenue traffic until 1995. It is expected that the relationship between air taxi revenue traffic and air taxi operations will remain the same during the period. Freight and mail traffic at Unalaska are also assumed to be generated and consumed by the towns population and **economy**.

There is very little casual or private air activity at Unalaska, partly because flying conditions are difficult. Much of the general aviation activity occurring there is involved in the fishing industry, for example, spotting airplanes. General aviation activity is therefore likely to grow with the general economy of Unalaska. When the new, extended runway is in operation in 1995, it is expected to result in dramatic changes in both patterns and levels of traffic at Unalaska.

Many of the passengers and much of the cargo using Unalaska airport must presently either transplant at Cold Bay or sit

through stopovers at minor communities **enroute** to or from the principal city to which **Unalaska** is connected, Anchorage. otherwise it is necessary to utilize a twin turboprop such as an F-27, which is less cost effective and slower than a jet. Upon completion of the runway extension, faster and cheaper jet service will become available. The result is likely to be an increase in demand simply due to lower costs for air service: cheaper tickets and less time spent **enroute**.

At the same time, it is expected that **Unalaska** will take over some of Cold Bay's role as regional airport. In particular, more short-haul air taxi service will move over to **Unalaska** from Cold Bay. Thus, there will be an increase in traffic as a result of a shift in the route structure.

It is also anticipated that passenger traffic will increase considerably immediately upon completion of the **Unalaska** runway extension. Air freight throughput will increase similarly, given lower charges and better service. Mail will be much less affected, as the cost to users will not change; however, more of the nearby communities will be served from **Unalaska** rather than Cold Bay.

The ratio of air carrier operations to passenger traffic will plunge once the airport is improved. Operators will immediately take advantage of the facility and **begin jet service between Anchorage and Unalaska**. These larger aircraft will carry more passengers per flight than the aircraft currently serving **Unalaska**. Air taxi activity will also increase given the improved runway, but the shift will be less dramatic than for air carrier traffic (see Table 42),

### Cold Bay

Cold Bay presently functions as the regional center for air transport in the study region and is expected to continue to do so at least until 1995. There is little non-airport economic activity there to generate traffic. Thus it is expected that passenger and cargo throughput at Cold Bay will grow as a function of growth in population and employment of the region as a whole. Similarly, growth in air taxi and general aviation activity are likely to be linked to region-wide economic and demographic trends.

upon completion of the runway improvement at Unalaska airport in 1995, traffic will drop at Cold Bay as transit traffic enroute between Anchorage and Unalaska stops going through Cold Bay. However, over-ocean flights from the Lower 48 will continue to come into Cold bay as Unalaska will still be unable to accommodate them. Similarly, there will still be long haul cargo flights utilizing the field for refueling stopovers.

### St. Paul

The airport on St. Paul Island serves the air transport needs generated by the local Aleut community, the seal harvest, tourists wishing to observe wildlife, and the National Marine Fisheries Board personnel stationed there. It is assumed that current patterns will continue until 1990, when a bottomfish processing plant will be established there, permitting the development of a local bottomfishing industry. Until then, traffic will continue to be based on the demand of the local economy in a pattern similar to the recent past.

In 1990 a transient population will be attracted to the island by the opportunity for employment in the fishing industry, adding to demand for passenger enplanements. A viable bottomfish industry will generate a supply of fresh products that will add to air cargo shipments. Overall, demand for air transport will increase as result of the new economic activity expected to occur there.

## TRAFFIC FORECASTS

### Unalaska

From 1982 to 1994, total enplanements are expected to increase at an 8.5 percent per annum rate, to a level almost three times the 1981 level. For the same period, air freight is expected to grow at slightly over 7 percent, more than doubling present shipments. In 1995, passenger traffic is expected to jump 25 percent and cargo shipments are expected to increase 20 percent upon completion of the longer runway and general airport improvements (Table 41). Thereafter, passenger and cargo throughput are expected to increase at the underlying growth rate

TABLE 341

## FORECAST OF PASSENGER AND CARGO ENPLANEMENT FOR UNALASKA

## BASE CASE - NAVARIN BASIN LEASE-SALE

<u>ESTIMATED</u>	<u>PASSENGER ENPLANEMENTS</u>		<u>ANNUAL CARGO ENPLANEMENTS</u>			
	<u>AIR CARRIER</u>	<u>AIR TAXI &amp; COMMUTER</u>	<u>TOTAL</u>	<u>FREIGHT</u>	<u>MAIL</u>	<u>TOTAL TONS</u>
1980	12,330	600	12,930	92.0	71.0	163.0
1981	10,610	1,250	11,860	154.2	75.2	229.4
<u>PROJECTED</u>						
1982	11,500	1,360	12,860	120.0	75.0	195.0
1983	12,470	1,480	13,950	129.0	80.0	209.0
<b>1984</b>	<b>13,510</b>	<b>1,610</b>	<b>15,120</b>	<b>139.0</b>	85.0	244.0
1985	14,650	1,750	16,400	149.0	90.0	239.0
1986	15,880	1,900	17,780	160.0	96.0	256.0
1987	17,210	2,080	19,290	172.0	103.0	275.0
<b>1988</b>	18,660	2,250	20,910	<b>185.0</b>	109.0	294.0
1989	20,230	2,450	22,680	199.0	117.0	316.0
1990	21,930	2,660	24,590	214.0	124.0	338.0
1991	23,770	2,900	26,670	230.0	132.0	362.0
1992	25,770	3,150	28,920	247.0	141.0	388.0
1993	27,930	3,430	31,360	266.0	150.0	416.0
<b>1994</b>	30,280	3,720	34,000	286.0	160.0	446.0
1995	37,820	4,680	42,500	343.0	170.0	513.0
1996	41,000	5,070	46,070	369.0	181.0	550.0
1997	44,440	5,500	49,940	397.0	193.0	590.0
1998	48,170	5,960	<b>54,130</b>	426.0	205.0	631.0
1999	52,220	6,460	58,680	458.0	212.0	670.0
2000	56,610	7,000	63,610	493.0	219.0	712.0

Source: Louis Berger &amp; Associates, Inc.

as determined by employment and propensity to fly. Table 36 summarizes the forecasts of passenger and cargo enplanement.

Air carrier operations are expected to increase at a faster rate than enplanements, a reverse of the usual trend. It is foreseen that the current trend to fly smaller aircraft between Anchorage and Unalaska will continue. Thus it is expected that air carrier arrivals at Unalaska will more than triple during the next dozen years. On the other hand, air taxi operations are expected to increase at the same rate as revenue traffic.

In 1995, air carrier operations are forecast to drop in half, in spite of the increase in air carrier traffic. It is expected that as soon as the airport is improved, operators will begin using jet aircraft on the Unalaska-Anchorage run rather than twin turbine aircraft. The jets will enplane a greater number of passengers than the turbines. Table 42 gives the forecast of aircraft operations to 2000.

#### Cold Bay

Passenger enplanements at Cold Bay are expected to grow steadily at a rate of about 6.5 percent between now and 1994, increasing to more than double current levels. Cargo enplanements are forecast to increase somewhat more slowly, at about 5 percent per annum, nearly doubling over the period.

Upon completion of the airport improvement at Unalaska, Cold Bay passenger enplanements are expected to drop some 25 percent, as passengers cease traveling to Unalaska via Cold Bay. Cargo traffic is expected to drop a similar amount.

After 1995, Cold Bay's traffic will grow, but at a slower rate than previously. The fastest growing part of the regional market will no longer receive the bulk of its service via cold Bay. Table 43 summarizes the forecast of passenger and cargo enplanements at Cold Bay to 2000.

It is expected that air carrier operations will grow at a rate slower than that of passenger enplanements consistent with the general trend towards use by airlines of larger aircraft. Air taxi enplanements are forecast to grow at the same rate as air taxi passenger enplanements, under the assumption that

TABLE 42

FORECAST OF AIRCRAFT OPERATIONS FOR UNALASKA-DUTCH HARBOR

BASE CASE - NAVARIN BASIN LEASE SALE					
<u>ESTIMATED</u>	<u>AIR CARRIER</u>	<u>AIR TAXI &amp; COMMUTER</u>	<u>GENERAL AVIATION.</u>	<u>OCS ST. GEORGE</u>	<u>TOTAL</u>
1980	583	200	200		1, 183
1981	568	400	200		1, 168
<u>PROJECTED</u>					
1982	630	433	207		1, 270
<b>1983</b>	699	469	214	548	1, 930
1984	775	508	222	548	2, 053
1985	831	550	730	548	2, 159
1986	918	595	238	548	2, 299
1987	1, 015	645	246	548	2, 454
<b>1988</b>	1, 122	698	254		2, 074
1989	1, 240	756	263		2, 256
1990	1, 370	<b>818</b>	273		2, 461
1991	1, 509	886	282		2, 677
1992	1, 663	960	292		2, 915
1993	1, 832	1, 039	302		3, 173
<b>1994</b>	2, 019	<b>1,125</b>	<b>313</b>		3, 457
1995	946	1, 440	324		<b>2,710</b>
1996	1, 025	1, 560	335		2, 920
1997	<b>1,111</b>	1, 692	347		3, 150
<b>1998</b>	1, 205	1, 834	359		3, 398
<b>1999</b>	1, 306	1, 987	<b>371</b>		2, 664
2000	1, 416	2, 154	384		3, 954

Source: Louis Berger &amp; Associates, Inc.

TABLE 43

FORECAST OF PASSENGER AND CARGO ENPLANEMENT AT COLD BAY

## BASE CASE - NAVARIN BASIN LEASE SALE

<u>ESTIMATED</u>	<u>ANNUAL PASSENGER ENPLANEMENTS</u>			<u>ANNUAL CARGO ENPLANEMENTS</u>		
	<u>AIR CARRIER</u>	<u>AIR TAXI &amp; COMMUTER</u>	<u>TOTAL</u>	<u>FREIGHT</u>	<u>MAIL</u>	<u>TOTAL TONS</u>
1980	24, 996	1, 500	26, 496	423. 8	348. 8	772, 6
<u>PROJECTED</u>						
1981	26, 620	1, 600	28, 200	449. 0	363. 0	812. 0
1982	28, 350	1, 700	30, 050	476. 0	377. 0	853. 0
<b>1983</b>	30, 190	1, 810	32, 000	504. 0	392. 0	896. 0
1984	32, 160	1, 930	34, 090	534. 0	408. 0	942. 0
1985	34, 250	2, 060	36, 310	566. 0	424. 0	990. 0
1986	36, 470	2, 190	38, 660	600. 0	441. 0	1, 041. 0
1987	38, 840	2, 330	41, 170	636. 0	458. 0	1, 094. 0
1988	41, 370	2, 480	43, 850	673. 0	478. 0	1, 151. 0
1989	44, 060	2, 640	46, 700	714. 0	495. 0	1, 209. 0
1990	46, 920	2, 820	49, 740	756. 0	515. 0	1, 271. 0
1991	49, 970	3, 000	52, 970	801. 0	535. 0	1, 336. 0
1992	53, 220	<b>3, 190</b>	56, 410	849. 0	557. 0	1, 406. 0
1993	56, 680	3, 400	60, 080	900. 0	579. 0	1, 479. 0
1994	60, 360	3, 620	63, 980	953. 0	602. 0	1, 555. 0
1995	48, 290	2, 900	<b>51, 190</b>	762. 0	<b>501. 0</b>	1, 263. 0
1996	50, 700	3, 040	53, 740	808. 0	521. 0	1, 329. 0
1997	53, 240	3, 190	56, 430	857. 0	542. 0	1, 399. 0
1998	55, 900	3, 350	59, 250	908. 0	563. 0	1, 471. 0
1999	61, 630	3, 520	65, 150	963. 0	586. 0	1, 549. 0
2000	64, 710	3, 880	68, 590	1, 020. 0	609. 0	1, 629. 0

Source: Louis Berger &amp; Associates, inc.

enplanements per air taxi operation will remain the same. Enplanements of all service categories are projected to drop in 1995 when the Unalaska runway is enlarged, then to grow more slowly than was previously the case. Table 44 gives the forecast of aircraft operations at Cold Bay.

#### St. Paul.

Passenger and cargo enplanements at St. Paul are projected to increase at a 3 percent and 2 percent growth rate respectively, in line with the slow growth of the economy and population in present circumstances.

When the bottom fishing plant is operating in 1990, a significant incremental increase of passengers is expected to occur, generated by the needs of transient labor needed to help in the fishing industry. Cargo enplanements are forecast to increase in that year as well. Thereafter, it is forecast that the growth rate of both passengers and cargo will be higher than in the past, as the local economy grows and employment on the island of both permanent and transient labor increases. Table 45 gives the forecast of passenger and cargo enplanements.

It is anticipated that St. Paul will retain its air carrier stop-off service between the Aleutians and Anchorage, and that as a result air carrier enplaned passengers will not bear a strict relationship with air carrier operation. However, taxi operations will be quite strictly linked to air taxi revenue traffic. Table 46 summarizes the forecast of aircraft operations to 2000.

#### Anchorage.

Most of the study area's interregional air traffic activity is with Anchorage, the aviation center of Alaska, and until quite recently, nearly all was transported by Reeve Aleutian Airways.

Table 47 shows passengers and cargo enplaned by Reeve at Anchorage for 1979 and 1980, as well as operations by aircraft type and whether scheduled or unscheduled. Anchorage is Reeves busiest airport. Between 1979 and 1980, passenger enplanements dipped, mirroring patterns at Cold Bay and Unalaska. Air freight was down but air mail was up, with a net increase in total air

FORECAST OF ANNUAL AIRCRAFT OPERATIONS AT COLD BAY  
 BASE CASE - NAVARIN BASIN LEASE SALE

				0cs ST. GEORGE	
	<u>ESTIMATED</u>	<u>AIR CARRIER</u>	<u>AIR TAXI</u>	<u>HELI COPTER</u>	<u>TOTAL</u>
	1980	1,810	460		3,270
	<u>PROJECTED</u>				
	1981	1,910	500		3,450
	1982	2,010	540		3,630
	1983	2,130	580	2,920	6,750
	1984	2,240	620	2,920	6,950
	1985	2,370	670	2,920	7,170
	1986	2,500	730	2,920	7,410
	1987	2,630	790	2,920	7,650
	1988	2,780	850		5,000
	1989	2,930	920		5,270
	1990	3,090	990		5,560
	1991	3,260	1,070		5,860
	1992	3,440	1,150		6,190
	1993	3,630	1,240		6,530
	1994	3,830	1,340		6,890
	1995	2,870	1,120		5,280
	1996	3,000	1,200		5,580
	1997	3,130	1,280		5,890
	1998	3,280	1,370		6,230
	1999	3,420	1,470		6,580
	2000	3,580	1,570		6,960

Source: Louis Berger & Associates, inc.

TABLE 45

FORECAST OF PASSENGER AND CARGO ENPLANEMENTS FOR ST. PAUL

## BASE CASE - NAVARIN BASIN LEASE SALE

<u>ESTIMATED</u> 1980 <u>PROJECTED</u>	<u>ANNUAL PASSENGER ENPLANEMENTS</u>		<u>ANNUAL CARGO ENPLANEMENTS</u>			
	<u>AIR CARRIER</u>	<u>AIR TAXI</u>	<u>TOTAL</u>	<u>FREIGHT</u>	<u>MAIL</u>	<u>TOTAL TONS</u>
1981	2,226	450	2,676	20.0	23.0	<b>52.0</b>
1982	2,360	460	2,750	30.0	23.0	53.0
<b>1983</b>	2,430	490	2,920	30.0	23.0	53.0
1984	2,510	510	3,020	31.0	24.0	55.0
1985	2,580	520	<b>3,100</b>	31.0	24.0	55.0
1986	2,660	540	3,200	32.0	24.0	56.0
1987	2,740	550	3,290	33.0	24.0	57.0
1988	2,820	570	3,390	34.0	25.0	58.0
1989	2,900	590	3,490	34.0	25.0	59.0
1990	3,920	840	4,760	46.0	33.0	79.0
<b>1991</b>	4,070	870	4,940	49.0	35.0	84.0
1992	4,220	910	5,130	52.0	36.0	88.0
1993	4,380	940	5,320	55.0	38.0	93.0
1994	4,550	980	5,530	58.0	40.0	98.0
1995	4,720	1,010	5,730	62.0	42.0	<b>104.0</b>
1996	4,900	1,050	5,950	65.0	44.0	<b>109.0</b>
1997	5,090	1,090	6,180	69.0	46.0	<b>115.0</b>
<b>1998</b>	5,280	<b>1,130</b>	6,411	73.0	49.0	122.0
1999	5,480	1,186	6,665	78.0	51.0	<b>129.0</b>
2000	5,690	1,220	6,910	82.0	54.0	<b>136.0</b>

Source: Louis Berger &amp; Associates, Inc.

TABLE,46

ANNUAL AIRCRAFT OPERATIONS AT ST. PAUL  
BASE CASE - NAVARIN BASIN LEASE SALE

<u>ESTIMATED</u>	<u>AIR CARRIER</u>	<u>AIR TAXI</u>	<u>GENERAL AVIATION</u>	<u>TOTAL</u>
1980	108	100	100	300
<u>PROJECTED</u>				
1981	110	100	100	310
1982	110	100	110	320
1983	120	110	110	340
1984	120	110	110	<b>340</b>
1985	130	110	120	360
1 9 8 6	130	110	120	360
1987	140	120	130	390
1988	140	120	130	390
1989	140	120	130	390
1990	150	150	130	430
1991	150	160	140	450
1992	150	160	140	450
1993	160	170	150	480
1994	160	170	150	480
1995	170	180	160	510
1996	170	190	160	520
1997	180	190	170	540
1998	180	200	170	550
1999	190	210	180	580
2000	200	220	180	600

Source: Louis Berger & Associates, Inc.

TABLE 47

REEVE ALEUTIAN AIRWAYS TRAFFIC AND OPERATIONS STATISTICS FOR  
ANCHORAGE INTERNATIONAL AIRPORT

	<u>1979</u>	<u>1980</u>	<u>PERCENT CHANGE</u>
<b>ENPLANED PASSENGER</b>			
Schedul ed	26,656	24,223	
Non-schedul ed	941	1,251	
Total Passengers	27,597	25,474	-7.7%
<b>Enplaned Revenue Tons</b>			
Frei ght	1,426.68	1,280.08	
Mail	2,662.21	2,399.88	
Total	3,488.89	3,679.96	+5.5%
<b>Operations by Aircraft Type</b>			
Schedul ed			
C-46	41	---	
YS-11	400	466	
L-188	469	476	
Total Schedul ed	910	942	+3.5%
Non-schedul ed			
C-46	36	---	
YS-11	22	15	
L-18	12	27	
Total non-schedul ed	70	42	
Total operations	980	984	+ .4%
Departures schedul ed	855	906	+6.0%
Schedul ed departures	820	893	
Percentage of Departures Schedul ed	96%	99%	

Source: FAA Airport Activity Statistics, 1979 and 1980.

cargo resulting. Operations increased over the year.

Table 48 shows Reeve's activity as a percentage of air carrier activity at Anchorage International Airport. This is a good measure of the proportion of Anchorage traffic generated in the study area. One sees that traffic between the study area and Anchorage cargo enplanement, and 5 percent of both scheduled flights and total operations at Anchorage International.

The Tables 49 and 50 show forecasts of future operations, and cargo and passenger enplanements for Anchorage. Itinerant and total operations are expected to increase 240 percent between 1980 and 2000. At the same time, passenger and cargo enplanements are expected to more than quadruple. These forecasts are taken from the Alaska Aviation System Plan, 1981.

#### ANALYSIS OF AIR SYSTEM CAPACITY

For the assessment of air side capacity one considers the components of the airfield: the runways, taxiways, and apron-gate areas. Air side refers to areas where the aircraft operates: they land on runways, clear the strip by taxiways, and park on aprons. The FAA has developed criteria with which to determine whether additional runways, taxiways, and apron parking space should be constructed. These FAA criteria determine the number of aircraft arrivals which can be accommodated on a peak hour and annual basis without undue delay, given an appropriate fleet mix.

The issue of the size of aircraft which can be accommodated is another matter. This is determined by the length and width of the runway, and its surface and load-bearing capacity. This latter consideration is a more pertinent issue than the former one.

Land side infrastructure and capacity refers to the airport facilities not primarily used for the movement, storage, and servicing of aircraft. This includes passenger terminals, cargo terminals, and interface with other modes (i.e., access roads, parking, etc.).

TABLE 48

REEVE ALEUTIAN AIRWAYS TRAFFIC AND OPERATIONS AS A PERCENTAGE OF ANCHORAGE  
INTERNATIONAL AIRPORT AVIATION ACTIVITY BY CERTIFIED AIR CARRIERS

	<u>1979</u>	<u>1980</u>
Enplaned Passenger	3.0%	2.8%
Enplaned Cargo		
Freight	1.3%	1.0%
Mail	7.9%	8.3%
Total	2.5%	2.2%
Scheduled Operations	4.9%	5.2%
Unscheduled Operations	36.3%	22.5%
Total Operations	5.3%	5.4%

Source: Louis Berger & Associates, Inc. and associates from the FAA Airport Activity Statistics, 1979 and 1980.

TABLE 49

FORECAST OF FUTURE TRAFFIC OPERATIONS AT ANCHORAGE INTERNATIONAL AIRPORT  
(IN THOUSANDS )

<u>ACTUAL</u>	<u>YEAR</u>	<u>ITINERANT</u>	<u>LOCAL</u>	<u>TOTAL</u>
	1979	178.0	33.0	211.0
<u>PROJECTED</u>				
	1980	189.2	34.8	224.0
	1981	201.2	36.6	237.8
	1982	213.9	38.5	252.4
	1983	227.4	40.6	268.0
	1984	241.7	42.7	284.4
	1985	257.0	45.0	302.0
	1986	263.4	46.1	309.5
	1987	267.9	47.3	315.2
	1988	273.5	48.5	322.0
	1989	279.2	48.5	328.9
	1990	285.0	51.0	336.0
	1991	298.5	53.4	351.9
	1992	312.7	56.0	368.7
	1993	327.5	58.6	386.1
	1994	343.0	61.4	404.4
	1995	359.3	64.3	423.6
	1996	376.4	67.4	443.8
	1997	394.2	70.6	464.8
	1998	412.9	73.9	486.8
	1999	432.5	77.4	509.9
	2000	453.0	81.1	534.1

Source: Louis Berger & Associates, Inc., from the Technical Report of the Alaska Aviation System Plan for the Alaska Department of Transportation & Public Facilities, 1982.

TABLE 50

FORECAST OF FUTURE PASSENGER AND CARGO ENPLANEMENTS AT ANCHORAGE INTERNATIONAL AIRPORT  
(IN THOUSANDS OF PASSENGER AND TONS)

<u>YEAR</u>	<u>PASSENGER</u>	<u>CARGO</u>
1979	1,018.6	77.9
1980	1,007.5	78.5
1981	1,122.8	85.7
1982	1,251.2	93.5
1983	1,394.3	102.0
1984	1,553.8	111.3
1985	1,731.6	121.5
1986	1,856.8	133.5
1987	1,991.0	146.8
1988	2,135.0	161.3
1989	2,289.3	177.3
1990	2,454.8	194.8
1991	2,627.1	208.5
1992	2,811.6	223.1
1993	3,009.0	238.8
1994	3,220.2	255.6
1995	3,446.3	273.5
1996	3,688.3	292.7
1997	3,947.2	313.3
1998	4,224.3	335.3
1999	4,520.9	358.8
2000	4,838.3	384.0

Source: Louis Berger & Associates, Inc. from the Alaska Aviation System Plan for the Alaska Department of Transportation and Public Facilities, 1982.

## Unalaska

In terms of air side capacity, Unalaska requires development. Even at present, aviation activity would change immediately if a full size, full service airport were constructed there.

The airport can handle forecast aircraft arrivals for the next few decades. A new parallel runway will not be needed in the twentieth or early twenty-first century. However, even now the runway length restricts the size of aircraft which can be used there, and the field is too short to handle any commercial jet aircraft. Thus, Unalaska is the only economic regional center in Alaska without a regional center airport. The airport would need a 762 meter (2,500 foot) longer runway, a new runway surface, and a wider runway in order to handle B-737 jet aircraft.

The lack of a taxiway reduces the number of flights that can be accommodated by a given runway. At Unalaska, aircraft may have to taxi the length of the runway to clear the strip. However, in terms of the number of forecast operations, the lack of a taxiway is not likely to become a governing constraint for the study period.<sup>a</sup>

Unalaska has two aprons, one 122 by 213 meters (400 by 700 feet) and another 651 by 152 meters (200 by 500 feet). In terms of area, this is sufficient to park more aircraft than are likely to be found at Unalaska in the near future. However, this apron space is located extremely close to the runway. In fact, the runway bisects the paved apron area, and this space is immediately adjacent to landing and departing aircraft.

The terminal buildings are old, and may warrant replacement simply on this basis. (Money has been funded to improve the terminal). They are located near the apron area, and are too

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according to Airport Capacity Criteria used in Long Range Planning FAA Advisory Circular AC 150/5060-3A, 1969) the practical annual capacity (PANCAP) is 195,000 operations. Due to the lack of taxiways, this capacity would be reduced to about 40 percent or 78,000 operations a year for IFR.

close to the runway centerline, and they constitute an aviation hazard. At present there are enough facilities not to constrain forecast growth of air cargo and passengers. There are not, however, facilities to process fresh seafood for air shipment to Anchorage or the Lower 48.

### Cold Bay

The air side facilities at Cold Bay are the best in the Aleutians. With two runways, the Cold Bay Airport can handle more aircraft arrivals per year or per hour than are expected to demand it, well into the twenty-first century. There are turnaround areas at the ends of each runway. There are no parallel taxiways but there is such ample capacity that none are required. There is adequate paved aircraft parking area for the foreseeable future.

The main runway is quite long and can handle **any sized** aircraft up to and including B-747 jumbo jets. It is well paved and can carry such loads easily. In short, the air side facility at Cold Bay can handle any of the size or volume of aircraft that can be reasonably expected to use the airport.

The land side storage and cargo facilities, although antiquated, are adequate for current and forecast future use. The passenger terminal is already cramped. In the event that new facilities were deemed necessary, there is space in the airport area suitable for their development.

In short, there are no governing constraints in the air side infrastructure. The land side facilities are currently acceptable and can be easily improved.

### St. Paul

The practical annual capacity of St. Paul's runway is sufficient to handle all foreseen operations demand. A taxiway is not required for anticipated traffic levels. There is adequate parking space.

The runway is long enough for fully loaded Electras but not long enough for commercial jets. It is gravel, volcanic

material. This is adequate for the foreseen needs, as the economy of the island is unlikely to require service from high capacity high performance aircraft. The runway is not well drained during spring break-up and could be improved in this respect.

Land side airport facilities are not available; there is no terminal, or even shelter for cargo.

CHAPTER V

IMPACT OF OCS DEVELOPMENT

## V. IMPACT OF OCS DEVELOPMENT

This chapter analyzes the impacts on the transportation system of the OCS activities referred to as "Exploration, Development and Production Phases for the Mean Case Scenario" for the Navarin Basin Lease Sale 83. During the exploration phase the lease holders will decide whether or not to continue with the commercial development of the field. The mean scenario used here assumes that the Navarin Basin can produce sufficient oil (gas is not considered in this analysis) to justify the sizeable investments needed to bring this field into production.

### Expected OCS Events and Material Requirements

The exploration phase in the Navarin Basin area will occur over the period 1986 through 1991 with full scale construction of land based facilities and the offshore pipelines beginning in 1992. Approximately 26 exploration and 13 delineation wells will be drilled during this phase. It is assumed that pipeline will be assembled at St. Matthew and Dutch Harbor where it will be coated prior to placement. The drilling of the production wells will begin in 1993, and a total of 227 of these wells will be developed. Support bases for the development of the Navarin Basin will be located at St. Matthew (air and marine), Cold Bay (air), and Unalaska-Dutch Harbor (marine).

The development of St. Matthew Island is critical in the air support of the Navarin Basin. Assuming that this development mode is made possible by a land status change, two gravel cross runways are planned for the exploration phase of development. During this period, a small port would be built for a service base, but its exact configuration has not been determined. The offshore drilling rigs during this phase will be supported directly from Dutch Harbor. During the latter phases of the development of this field, an oil terminal would be built at St. Matthew which would be able to accommodate tug and barge shipments directly from the continental U.S.A. A remote oil terminal would be built on the southern coast of the Alaska Peninsula near Cold Bay. A road would connect the oil terminal with Cold Bay. Marine and air services for this facility will be provided through Cold Bay.

The materials and supplies required for Navarin Basin exploration and development are associated with drilling during

the exploration and production phases and for the construction of a submarine pipeline from the Navarin Basin to St. Matthew. The quantities of supplies and materials needed for exploration and production wells and for pipeline construction are presented in Table 51.<sup>a</sup> These quantities were adjusted to reflect anticipated deeper well depths that would be experienced in the Navarin Basin. Material requirements by calendar year and by type are presented in Table 52.

#### OCS Related Population and Employment

After lease sale 83, population and employment for the Aleutian region are expected to increase up to a maximum of 6 percent and 8 percent, respectively, due to OCS activity (see Table 53). The effects are first noticeable in 1985 and rise to a peak in 1993. Then they decline to a medium level after 1996.

This regional population increase is primarily concentrated in Dutch Harbor (Table 54) with a small percentage (20-48 people) at Cold Bay (Table 55). St. Matthew Island could have a substantial enclave population, if a service base and oil terminal were allowed there. It could rise to over 1,000 during construction of the oil terminal (Table 56).

Offshore (barge or platform) based employment (Table 57) is much larger than the land-based employment due to the physical isolation of the drilling rigs or production platforms in the Navarin Basin. Offshore production workers would top 4,000 in peak years which is more than five times the levels expected for exploration.

Remote site employment for the oil terminal on the Alaska Peninsula is expected primarily during the construction phase (Table 58). This would tail off to a relatively small number (30-59) in later years under the mean production scenario.

These population and employment forecasts with OCS development were used to predict the indirect demand for transportation services in the following sections.

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<sup>a</sup>Peat, Marwick & Mitchell & Co., 1981.

TABLE 51

MATERIAL REQUIREMENTS**NAVARIN** BASIN LEASE SALE 83 - **IMPACT** OF OCS DEVELOPMENTa. DRILLING **MATERIAL** DEMAND IN BY MODE (TONS PER WELL)

	EXPLORATION <u>WELL</u>	PRODUCTION <u>WELL</u>
	<u>MARINE AIR</u>	<u>MARINE AIR</u>
Tubular Goods	400	330
Drilling Mud	800	320
Cement	250	180
Fuel	825	700
Fresh Water	4,800	3,000
Misc.	<u>5</u> <u>5</u>	<u>4</u> <u>4</u>
	7,080 5	4,534 4

b. PIPELINE CONSTRUCTION **DEMAND** (TONS PER MILE)

<u>PIPE SIZE</u>	UNCOATED <u>PIPE</u>	COATING <u>MATERIALS</u>	<u>TOTAL (TONS)</u>	LOST DUE TO <u>CONTAMINATION (1:10)</u>	<u>FUEL</u>
large diameter	800	1,100	1,900	2,100	275

Source: Abstracted from Technical Report #58, (PMM, September, 1981).

TABLE 5 2

TOTAL DIRECT MATERIAL DEMAND**NAVARIN BASIN ( LEASE SALE 83) - IMPACT OF OCS DEVELOPMENT**

CALENDAR YEAR	YEARS AFTER LEASE SALE	EXPLORATI ON WELLS (NO. )	PRODUCTI ON WELLS (NO. )	PIPE- LINE MILES	DRI LLING MATERIAL DEMAND			PI PELINE (TONS)			TOTAL ORY (TONS)	TOTAL FUEL (TON\$
					DRY FREIGHT	DRI LL HATER	FUEL	UNCOATED PIPE	COAT ING MATERI ALS	FUEL		
1984	0											
1985	1											
1986	2	3			4,365	14,400	2,475				4,365	2,475
1987	3	8			11,640	38,400	6,600				11,640	6,600
1988	4	9			13,095	43,200	7,425				13,095	7,425
1989	5	9			13,095	43,200	7,425				13,095	7,425
1990	6	6			8,730	28,800	4,950				8,730	4,950
1991	7	3			4,365	14,400	2,475				4,365	2,475
1992	8	1		150	1,455	4,800	825	132,000(1)	165,000(1)		298,455	825
1993	9		18	75	15,012	54,000	12,600	66,000(0)	82,500(0)	18,750	163,512	31,350
1994	10		36	75	30,024	108,000	25,200	66,000(0)	82,500(0)	18,750	178,524	43,959
1995	11		65		54,210	195,000	45,500				54,210	45,500
1996	12		42		35,028	126,000	29,400				35,028	29,400
1997	13		29		24,186	87,000	20,300				24,186	20,300
1998	14		20		16,680	60,000	14,000				16,680	14,000
1999	15		10		8,340	30,000	7,000				8,340	7,000
2000	16		7		5,838	21,000	4,900				5,838	4,900

Notes:

- 1 = Inbound only
- 0 = Outbound only

Source: Table 5 and Consultant's calculations.

REGIONAL POPULATION AND EMPLOYMENT

NAVARIN BASIN SALE 83 - IMPACT OF OCS DEVELOPMENT

EMPLOYMENT

POPULATION

CALENDAR YEAR	YEAR AFTER LEASE SALE	BASE CASE TOTAL EMPLOYMENT <sup>a</sup>	ABSOLUTE IMPACT		TOTAL ADDED Employment	BASE CASE TOTAL Population	ABSOLUTE IMPACT		TOTAL COMMUNITY POPULATION
			RESIDENT EMPLOYMENT	OCS ENCLAVE EMPLOYMENT			RESIDENT POPULATION	OCS ENCLAVE POPULATION	
1981		4,429			4,429	6,581			6,581
1982		4,532			4,532	<b>6,831</b>			6,831
1993		4,818			<b>4,818</b>	7,226			7,226
1984	0	5,107			5,107	7,614			7,614
1985	1	5,372	116	282	5,770	7,972	25	282	8,279
1986	2	5,587	64	166	5,817	8,276	<b>13</b>	166	8,455
1987	3	5,777	93	265	<b>6,135</b>	8,548	19	265	8,832
1988	4	5,945	99	285	6,329	8,792	20	285	9,097
1989	5	6,138	164	770	7,072	9,057	33	770	9,860
1990	6	6,266	<b>114</b>	468	6,848	9,260	23	468	9,751
1991	7	6,424	104	221	6,749	9,494	20	221	9,735
1992	8	6,621	204	561	7,386	9,771	39	561	<b>10,371</b>
1993	9	6,869	269	662	7,800	10,106	92	662	10,860
1994	10	<b>7,181</b>	284	488	7,953	10,518	120	488	11,126
1995	11	7,573	296	528	8,397	11,026	<b>158</b>	528	11,712
1996	12	8,070	307	540	8,917	11,662	156	540	12,358
1997	13	8,701	320	540	9,561	12,461	128	540	<b>13,129</b>
1998	14	9,500	336	540	10,376	13,470	85	540	<b>14,095</b>
1999	15	10,518	335	540	11,393	14,753	68	540	<b>15,361</b>
2000	<b>16</b>	11,165	334	<b>540</b>	12,039	15,736	69	540	16,345

<sup>a</sup>Excluding military.

Source: SCIMP-180 and NB-2.

TABLE 54

POPULATION AT DUTCH HARBOR  
**NAVARIN** BASIN SALE 83 - **IMPACT** OF OCS DEVELOPMENT

CALENDAR YEAR	YEAR AFTER LEASE SALE	BASE CASE TOTAL POPULATION	<u>ABSOLUTE OCS IMPACT</u>		TOTAL POPULATION
			<u>RESIDENT POPULATION</u>	<u>ENCLAVE POPULATION</u>	
1981		2,430			2,430
1982		2,586			2,586
1983		2,751			2,751
1984	0	2,928			2,928
1985	1	3,116	23	240	3,379
1986	2	3,316	12	146	3,474
1987	3	3,528	17	231	3,776
1988	4	3,756	18	248	4,022
1989	5	3,996	30	278	4,304
1990	6	4,254	21	212	4,487
1991	7	4,528	18	195	4,741
1992	8	4,819	35	235	5,089
1993	9	5,129	87	328	5,544
1994	10	5,460	115	418	5,993
1995	11	5,811	153	443	6,407
1996	12	6,186	151	443	6,780
1997	13	6,585	123	443	7,151
1998	14	<b>7,010</b>	80	443	7,533
1999	15	7,462	63	443	7,968
2000	16	7,945	64	443	8,452

Source: SCIMP-180 10/92 and NB-2.

POPULATION AT COLD BAY**NAVARIN BASIN SALE ,83 - IMPACT OF OCS DEVELOPMENT**

<u>CALENDAR</u> <u>YEAR</u>	YEAR AFTER <u>LEASE SALE</u>	<b>BASE CASE</b>	<u>ABSOLUTE OCS IMPACT</u>		<u>TOTAL</u> <u>POPULATION</u>
		<u>TOTAL</u> <u>POPULATION</u>	<u>RESIDENT</u> <u>POPULATION</u>	<u>ENCLAVE</u> <u>POPULATION</u>	
1981		277			277
1982		286			286
1983		296			296
1984	0	307			307
1985	1	316	2	42	360
1986	2	328	1	20	349
1987	3	338	2	34	374
1988	4	350	2	37	389
1989	5	362	3	42	407
1990	6	376	2	31	409
1991	7	388	2	26	416
1992	8	402	4	28	434
1993	9	417	5	36	458
1994	10	431	5	45	481
1995	11	447	5	48	500
1996	12	463	5	48	516
1997	13	480	5	48	533
1998	14	497	5	48	550
1999	15	515	5	48	568
2000	16	534	5	48	587

source: SCIMP - 180 10/82 and NB-2.

ST. MATTHEW BASED EMPLOYMENT

(NO GAS)

**NAVARIN BASIN SALE 83 - IMPACT OF OCS DEVELOPMENT**

CALENDAR YEAR AFTER		EXPLOR	SHORE	CONSTR.	OIL TERMINAL	PRODUCTI ON	PRODUCTI ON	PRODUCTI ON	PRODUCTI ON	TOTAL
YEAR	LEASE SALE	AIRCRAFT	BASE	SHORE BASE	CONSTRUCTION	AIRCRAFT	VESSELS	SHORE BASES	OIL TERMINAL	ST. MAT BASE
1980										
1981										
1982										
1983										
1984	0									
1985	1		5							5
1986	2	9	5					100		114
1987	3	24	5					100		<b>129</b>
1988	4	27	5					100		132
1989	5	27	5	6				100		138
1990	6	36	5	3		6	60	100		210
1991	7	18	5			15	150	150		338
1992	8	6	5		631	27	270	150		<b>1,089</b>
1993	9				631	36	380	150		1,197
1994	10					39	410	150	59	658
1995	11					39	410	150	88	687
1996	12					39	410	150	118	717
1997	13					39	410	150	<b>118</b>	717
1998	14					39	410	150	118	717
1999	15					39	410	150	118	717
2000	16					39	410	150	<b>118</b>	717

Source: SCIMP-180 10/82.

TABLE 57

· OFFSHORE BASED EMPLOYMENT  
(NO GAS)

NAVARIN BASIN SALE 83 - IMPACT OF OCS DEVELOPMENT

CALENDAR	YEAR AFTER	EXPLORATION	CONSTR. PLATFORM	PIPELINE	PRODUCTION	PRODUCTION	TOTAL
YEAR	LEASE SALE -	DRI L L I N G R I G S	I N S T A L L A T I O N	C O N S T R U C T I O N	D R I L L I N G	O P E R A T I O N S	O F F S H O R E B A S E D E M P L O Y M E N T
1980							
1981							
1982							
1983							
1984	0						
1985	1						
1986	2	240					240
1987	3	640					640
1988	4	720					720
1989	5	720					720
1990	6	480					480
1991	7	240	950			206	1,396
1992	8	80	1,424	672	448	515	3,139
1993	9		1,899	672	1,120	927	<b>4,618</b>
1994	10		1,424		2,016	1,236	4,676
1995	11		475		2,688	1,339	4,502
1996	12				2,912	1,339	<b>4,251</b>
1997	13				2,942	1,339	4,281
1998	14				2,539	1,339	3,878
1999	15				1,927	1,339	3,266
2000	16				1,076	1,339	<b>2,415</b>

Source: SCIMP-180 10/82.

**TABLE 58**

ALEUTIAN ISLANDS REMOTE SITE OCS EMPLOYMENT

<u>YEAR</u>	<u>EXPLORATION AND CONSTRUCTION</u>		<u>PRODUCTION</u>		<u>TOTAL</u>		<u>TOTP</u>
	<u>LOCAL</u>	<u>ENCLAVE</u>	<u>LOCAL</u>	<u>ENCLAVE</u>	<u>LOCAL</u>	<u>ENCLAVE</u>	
1980							
1981							
1982							
1983							
1984							
1985							
1986							
1987							
1988							
1989		450.				450.	450
1990		225.				225.	225
1991							
1992	16.	298.			16.	298.	314
1993	16.	298.			16.	298.	314
1994			4*	25.	4.	25.	30
1995			7.	38.	7.	38.	44
1996			9.	50.	9.	50.	59
1997			9.	50.	9.	50.	59
1998			9.	50.	9.	50.	59
1999			9.	50.	9.	50.	59
2000			9.	50.	9.	50.	59

Source: SCIMP-180, 10/82

## OCS Related Transportation Demand

### MARINE TRANSPORTATION DEMAND

Marine demand is centered in two locations: **Unalaska-Dutch Harbor** and **St. Matthew**. It is from these two sites that the offshore drilling rigs and later production platforms will be resupplied. To a lesser degree Cold Bay will attract marine traffic due to its position as a center of OCS air support (a considerable amount of fuel will be shipped to Cold Bay in order to service the aircraft which will be transiting through this regional hub).

Marine cargoes will be composed of materials required directly by OCS exploration, development and production, such as drilling material pipeline and other equipment and supplies. These are presented in Tables 51 and 52. Materials which are shipped as an indirect result of OCS activity, such as fuel for associated air operations, and shipments of direct and indirect consumables to OCS enclaves and additional community populations, also contribute to marine transportation demand. Dry cargoes will originate primarily from the continental U.S. as well as overseas. Fuel is anticipated to come from both Alaskan and continental U.S. refineries. Direct and indirect marine demands at **Unalaska-Dutch Harbor**, Cold Bay and **St. Matthew** are discussed below.

#### **Unalaska-Dutch Harbor**

Marine shipments to **Unalaska-Dutch Harbor** will consist of two components: materials directly associated with OCS activities, and indirect OCS consumables, such as supplies demanded on and offshore at Dutch Harbor. For purposes of estimating OCS direct demand, it is assumed that during the exploration phase (1984-1991), all marine demand is experienced at **Unalaska-Dutch Harbor**. During the development and production phases (1992-2000), 50 percent of this direct demand is experienced at **Unalaska-Dutch Harbor** (the remainder is shipped directly to the site).

Indirect offshore OCS consumable demand is assumed to be .15 tons per month per capita over a 6 month exploration period and development and production phases. Indirect onshore (Dutch

Harbor) demand is assumed to be .15 tons per month per capita over a 12 month period during both exploration and production phases. Total marine tranSpOrtatiOn demand at Unalaska-Dutch Harbor is presented in Table 59.

#### Cold Bay

Cold Bay marine demand will be composed of indirect demand for fuel related to an increase in air traffic and dry cargo indirect demand related to population increases at Cold Bay and remote Aleutian locations. It is assumed that increased fuel consumption will be related to increased air operations at Cold Bay by serving the OCS area and that this will be 1.5 tons per air operation.<sup>a</sup> Dry cargo demand is assumed to increase .15 tons per capita per increase in population. Further, .003 tons is assumed to be demanded per air passenger enplanement at Cold Bay to reflect transit passenger demand for consumables. Marine shipments to Cold Bay are presented in Table 60.

#### St. Matthew

Marine demand at St. Matthew is presented in Table 61. Direct OCS material demand is assumed to be 50 percent of all OCS development and production supplies and materials beginning in 1992. Indirect on and offshore OCS consumables (fuel and dry commodities) are assumed to be related to St. Matthew population increases as follows:

##### Dry Commodities:

- 1985 thru 1991 1.8 tons per capita per year over a 6 month period
- 1992 thru 2000 1.5 tons per capita per year over a 12 month period

##### Fuel:

- 1985 thru 1991 5 tons per capita per year over a 6 month period
- 1992 thru 2000 5 tons per capita per year over a 12 month period

---

<sup>a</sup>1.5 tons represents an average of 1.1 tons for general aviation operations and 1.7 tons for air carriers. It should be noted that OCS air activity will be skewed toward larger aircraft.

TABLE 59

## TOTAL MARINE TRANSPORTATION DEMAND AT UNALASKA-DUTCH HARBOR

CALENDAR YEAR	YEARS AFTER LEASE SALE	DIRECT MATERIAL DEMAND(1)				OCS-CONSUMABLE DEMAND				THRU PuT		TOTAL THRU PUT	
		WELL	PIPELINE	MATER (c)	FUEL	ON-SHORE		OFFSHORE		BASE CASE		WITH OCS	DEVELOPMENT
		ORY	ORY			DRY(2)	FUEL(3)	DRY	FUEL	DRY	FUEL	DRY	FUEL
		(a)	(b)			(e)	(f)	(g)	(h)	(i)	(j)	(h)	(i)
		(a)	(b)			(e)	(f)	(g)	(h)	(i)	(j)	(h)	(i)
1984	0												
1985	1	0		14,400	2,475	473	1,315	5	13	78,900	491,400	79,383	479,691
1986	2	4,365		14,400	2,475	284	790	319	285	76,200	513,500	85,852	519,810
1987	3	11,640		38,400	6,600	446	1,240	692	323	71,200	532,000	96,310	547,086
1988	4	13,095		43,200	7,425	478	1,330	767	330	67,300	553,600	95,502	570,440
1989	5	13,095		43,200	7,425	554	1,540	772	345	69,800	581,800	98,088	598,880
1990	6	8,730		28,800	4,950	419	1,165	621	525	72,400	611,500	91,521	623,615
1991	7	4,365		14,400	2,475	384	1,065	1,558	845	75,600	629,600	87,830	637,305
1992	8	728	149,000(1)	2,400	415	486	1,350	3,805	2,723	79,300	648,700	237,852	656,326
1993	9	7,506	74,000(0)	27,000	15,675	747	2,075	5,233	2,993	83,600	668,700	183,825	708,111
1994	10	15,012	74,000(0)	54,000	21,975	959	2,665	4,800	1,645	88,700	689,900	203,283	739,805
1995	11	27,105		97,500	42,750	1,073	2,980	4,670	1,718	95,100	711,900	159,723	803,816
1996	12	17,514		63,000	14,700	1,069	2,970	4,471	1,793	103,300	738,400	148,339	774,356
1997	13	12,093		43,500	10,150	1,019	2,830	4,498	1,793	113,600	765,800	147,801	792,516
1998	14	8,340		30,000	7,000	941	2,615	4,136	1,793	126,600	794,600	152,493	814,801
1999	15	4,170		15,000	3,500	911	2,530	3,585	1,793	143,700	806,500	160,121	819,616
2000	16	2,919		10,500	2,450	913	2,535	2,819	1,793	166,400	856,500	178,789	667,521

Notes:

1. See Table 52

{1} = Inbound

(0) = Outbound

2.Dry: 1.8 tons/year X (additional OCS population)

3.fuel: 5.0 tons/year X (additional OCS population)

4. Dry: 1884 thru 1992 1.8 tons/year 1/2 year X (additional population offshore and St. Matthew) after 1991 1 year and 1/2 to St. Matthew

5. Fuel: 5 ton/person/year X 1/2 year X (OCS personnel) 1985 thru 1991.

5 ton/person/year x 1 year x (UCS personnel) X 1/2 to Dutch Harbor 1992 thru 2000.

6.  $k = 2a + b + e + 2g + i.$ 7.  $i = 2d + f + 2h + j.$ 

Source: Louis Berger &amp; Associates, Inc.

TABLE 60

MARINE SHIPMENTS TO COLD BAY  
**NAVARIN BASIN (LEASE SALE 83) - IMPACT OF OCS DEVELOPMENT**

CALENDAR YEAR	YEARS AFTER SALE	FUEL (TONS)			DRY CARGO (TONS)		
		OCS		TOTAL	OCS		TOTM
		BASE CASE	INDIRECT DEMAND <sup>a</sup>		BASE CASE	INDIRECT DEMAND <sup>b</sup>	
1981		3,795	0	3,795	800	0	800
1982		3,993	0	3,993	828	0	828
1983		7,425	0	7,425	1,107	0	1,107
1984	0	7,645	0	7,645	<b>1,275</b>	0	1,275
1985	<b>1</b>	7,887	1,042	8,929	1,378	120	1,498
1986	2	8,151	1,257	9,408	1,341	86	1,427
1987	3	<b>8,415</b>	<b>2,199</b>	<b>10,614</b>	<b>1,136</b>	149	1,285
1988	4	5,500	2,376	7,876	<b>1,018</b>	162	<b>1,180</b>
1989	5	5,797	3,372	9,169	1,053	<b>1,021</b>	2,074
<b>1990</b>	6	<b>6,116</b>	2,330	8,446	1,090	555	1,645
1991	7	6,446	3,584	10,030	<b>1,128</b>	193	<b>1,321</b>
1992	8	6,816	<b>9,102</b>	15,918	<b>1,168</b>	976	<b>2,144</b>
1993	9	7,183	<b>12,307</b>	19,490	<b>1,209</b>	1,121	2,330
1994	10	7,579	<b>11,316</b>	18,895	1,251	595	1,846
1995	11	5,805	9,020	14,825	1,295	545	1,846
1996	12	6,138	8,592	14,730	1,340	557	1,897
1997	13	6,479	8,562	15,041	1,387	559	1,946
1998	14	6,853	7,861	14,714	1,436	531	1,967
1999	<b>15</b>	7,238	6,554	13,792	1,486	488	1,974
2000	16	7,656	5,194	12,850	1,538	429	1,967

<sup>a</sup>Fuel OCS consumables or indirect demand = 1.5 ton (air operation x air operations at Cold Bay).

<sup>b</sup>Dry cargo OCS indirect demand = (OCS population at Cold Bay and Remote Aleutian locations) x 0.15 tons/month x 12 months + (enplanement passengers) x 0.005 ton.

Source: Louis Berger & Associates, Inc.

TABLE 61:

## MARINE DEMAND AT ST. MATTHEW

## NAVARIN BASIN LEASE SALE 83 - IMPACT OF OCS DEVELOPMENT

CALENDAR YEAR	YEARS	DIRECT MATERIAL DEMAND <sup>a1</sup>				OCS-CONSUMABLES DEMAND					
	AFTER	DRY	DRY	WATER	FUEL	ST.	MATTHEW	OFFSHORE		DRY <sup>6</sup>	FUEL <sup>7</sup>
	LEASE	HELL	PIPELINE			DRY <sup>2</sup>	FUEL <sup>3</sup>	DRY <sup>4</sup>	FUEL <sup>5</sup>		
	SALE	(a)	(b)			(c)	(d)	(e)	(f)		
1984	0										
1985	1					5	13			5	13
1986	2					103	285			103	285
1987	3					116	323			116	323
1988	4					119	330			119	330
1989	5					124	345			124	345
1990	6					189	525			189	525
1991	7					304	845			304	845
1992	8	728	149,000(1)	2,400	415	980	2,723	2,825	7,848	157,086	<b>19,249</b>
1993	9	7,506	74,000(0)	27,000	15,675	1,077	2,993	4,156	11,545	98,401	57,433
1994	10	15,012	74,000(0)	54,000	21,975	592	1,645	4,208	11,690	113,032	68,975
1995	11	27,105		97,500	42,750	618	1,718	4,052	11,255	62,932	109,728
1996	12	17,514		63,000	14,700	645	1,793	3,826	10,251	43,325	51,695
1997	13	12,093		43,500	10,150	645	1,793	3,853	10,703	46,237	43,499
1998	14	8,340		30,000	7,000	645	1,793	3,490	9,695	24,305	35,183
1999	15	4,170		15,000	3,500	645	1,793	3,939	8,165	16,863	25,123
2000	16	2,919		10,500	2,450	645	1,793	2,174	6,038	10,831	18,769

## Notes:

1. See Table 52

2. Dry

a. 1.8 ton/person/year X 1/2 year X (St. Matthew pop.) 1985 thru 1991.

b. 1.5 ton/person/year X 1 year X (St. Matthew pop.) X 1/2 with D.H. 1992 thru 2000.

3. Fuel

a. 5 ton/person/year X 1/2 year X (St. Matthew pop.) 1985 thru 1991.

b. 5 ton/person/year X 1 year X (St. Matthew pop.) 1982 thru 2000.

4. See 2 b above but offshore population.

See 3 b above but offshore population.

$$i = 2a + b + e + 2g$$

$$7. \quad 2d + f + 2h$$

8. 1 = Inbound.

0 = Outbound.

Source: Louis Berger &amp; Associates, Inc.

It should be noted that marine demand at St. Matthew is contingent upon reclassification of the current land status of the Island. This marine demand assumes such a reclassification.

## MARINE TRANSPORTATION SYSTEM IMPACTS

### Capacity Effects

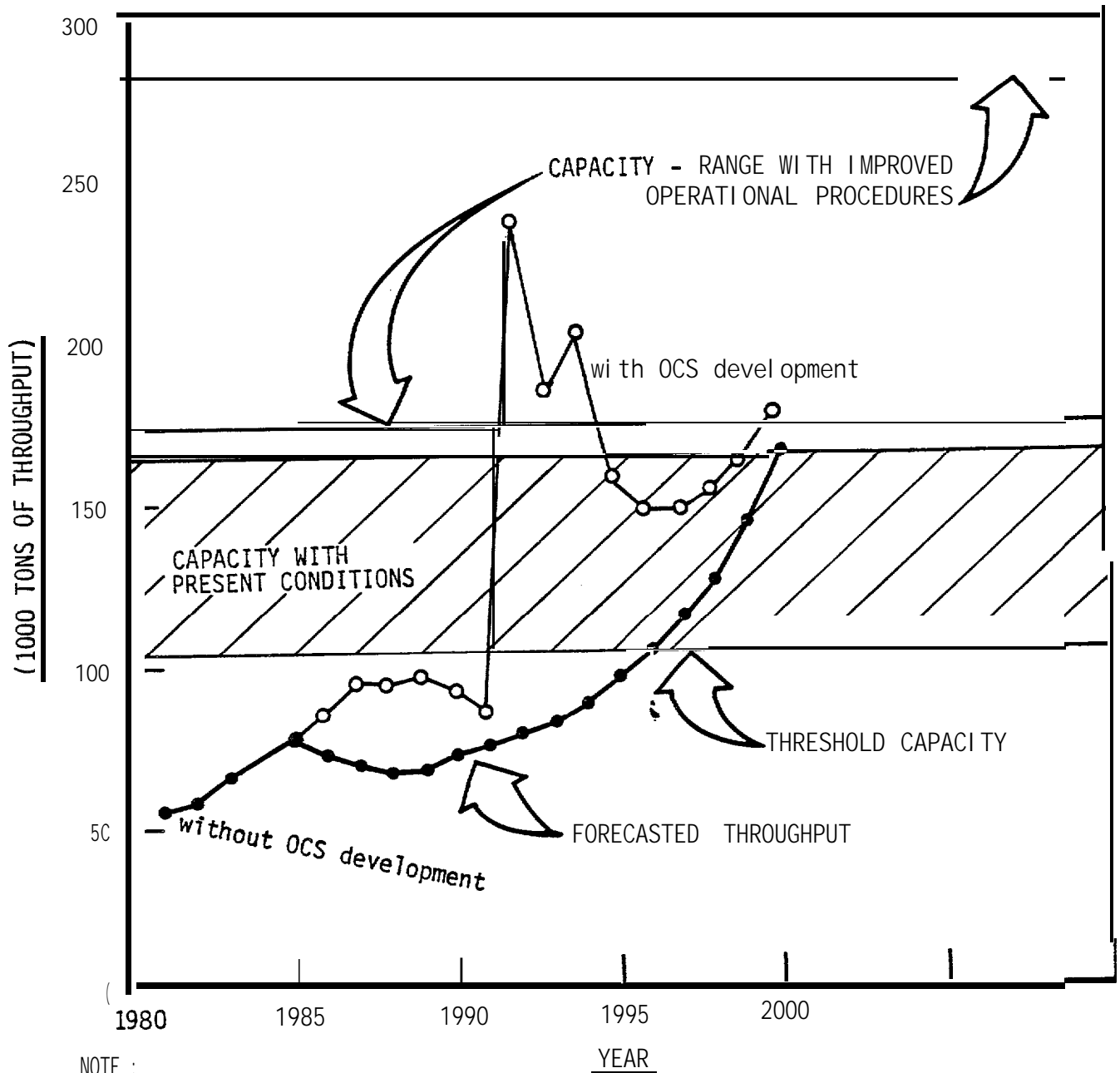
The major effects of increases in marine traffic due to OCS development in the Navarin Basin will be felt in Dutch Harbor. The increases in Cold Bay traffic are significant, but still represent only a small fraction of capacity. St. Matthew Island will be a new port if it is built, and adequate capacity would be assured in the design by the oil industry.

Dutch Harbor. The relation of forecast throughput to capacity in Dutch Harbor is illustrated in Figures 29 and 30, with and without mean case OCS development. For dry cargoes a major impact would be felt. During the exploration phase (up to 1991), forecast dry cargo throughput would rise to roughly twice current levels (50 percent over Base Case). This traffic would near the threshold for present operating conditions, but it can be accommodated with some congestion and delays.

In the development or construction phase starting in 1992, projected traffic will require major changes in port operating characteristics. Additional handling equipment, larger storage areas, and the use of all four Dutch Harbor docks as a unit (i.e., any empty dock would serve a waiting ship) will be required in order to accommodate forecast traffic. Additional docks may have to be built if the owners do not agree with these operation conditions.

It should be noted that the Base Case throughput is expected to exceed capacity by the year 2000, and that the Navarin Basin development effects only accelerate this requirement to 1992. However, it will take a certain amount of lead time to prepare for a major increase in traffic to be handled in the port. This means that 5-6 years should be allowed for an increase in infrastructure, and 2-3 years for an increase in handling capacity. Planning should start in 1985 for this decision. See Figure 30. The existing private bulk fuel operation is expected to expand to keep up with this capacity need.

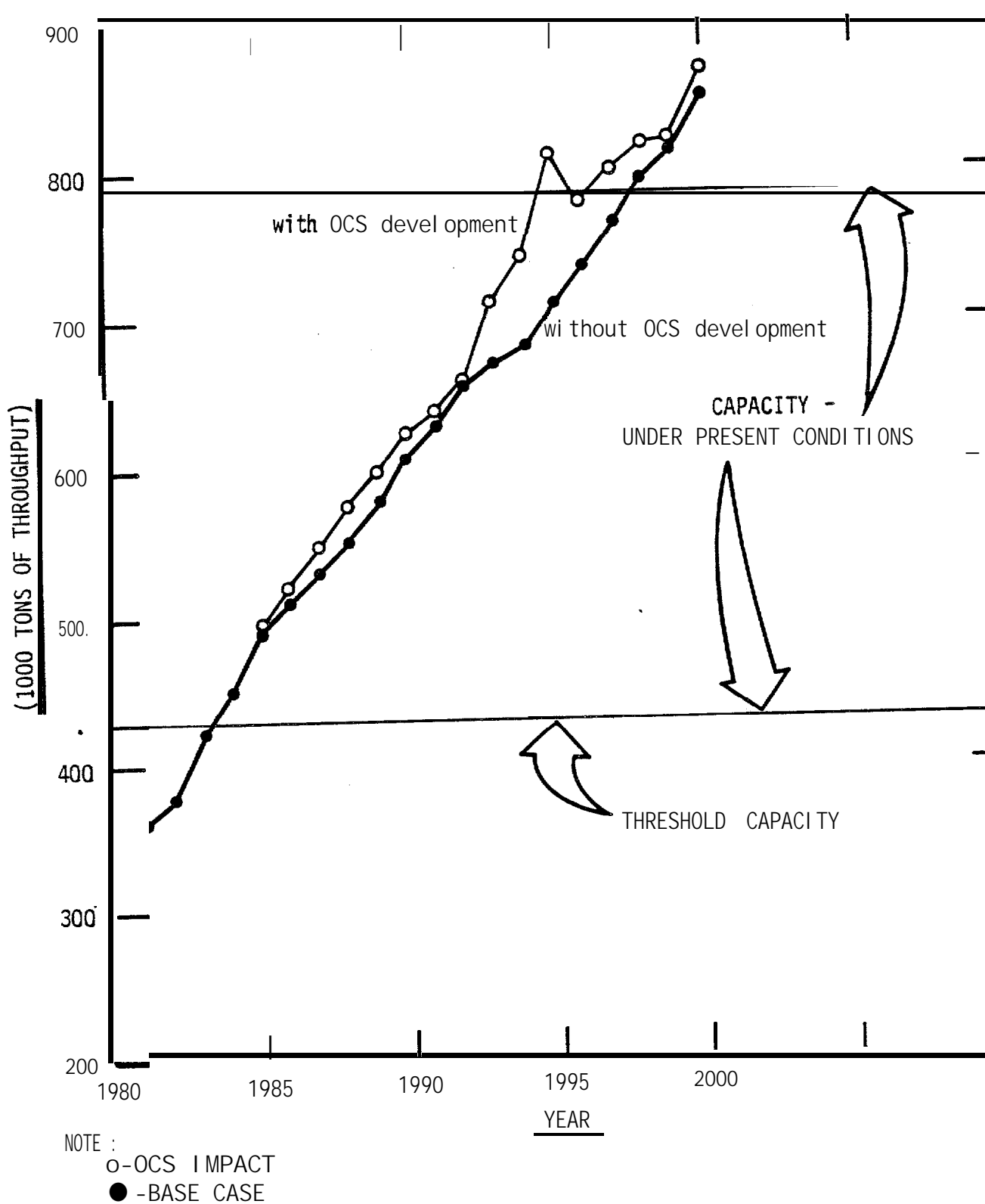
FIGURE 29  
 COMPARISON OF PORT CAPACITY AND FORECASTED PETROLEUM PRODUCTS  
 UNALASKA - DUTCH HARBOR  
 NAVARIN BASIN LEASE SALE 83 - IMPACT OF OCS DEVELOPMENT



NOTE :  
 ○ - OCS IMPACT  
 ● - BASE CASE

Source: Louis Berger & Associates, Inc., 1982

FIGURE 30  
 COMPARISON OF PORT CAPACITY AND FORCASTED DRY CARGOES  
 UNALASKA - DUTCH HARBOR  
 NAVARIN BASIN LEASE SALE 83 - IMPACT OF OCS DEVELOPMENT



Source: Louis Berger & Associates, Inc. , 1982

In the case of dry cargo (Figure 30), the additional traffic is much less important compared to the Base Case traffic. Also the high expected growth of Base Case traffic indicates some delays as soon as 1984, even without Navarin Basin development, and by 1998 new capacity will be required. The addition of Navarin Basin development will accelerate the need for new capacity by three years.

Cold Bay. The expected increase in traffic to Cold Bay is 100 percent for dry cargo (2,300 tons maximum). This represents less than 5 percent of its capacity and can easily be accommodated.

Fuel shipments are much more important for Cold Bay, and the maximum expected level of additional fuel shipped would be 12,000 tons, making a total of 19,000 tons in 1992. However, this amounts to less than 15 percent of the throughput capacity. The only potential constraint could be in storage capacity which is now 15,000 tons. This is not usually a real constraint as two or more equal shipments over the year would keep the total below capacity.

### Carriers

The impact on carriers will be felt in Dutch Harbor during the development phase of the Navarin Basin. Delays could be significant if no changes are made in port operations or infrastructure. This could mean a diversion of vessels to other ports, especially if an OCS supply base is set up with a special dock for Navarin Basin and other OCS activities. St. Paul or St. Matthew Island could get direct shipments of OCS supplies, if special barge trains are scheduled out of Seattle, as is done for the North Slope now. No new types of vessels would be required, but fleet expansion, especially sea-going barges, will be needed.

### **AIR TRANSPORTATION DEMAND**

Aviation demand has been analyzed as a system rather than looking at the demand requirements of each airport separately. This is done because of the role which Cold Bay air transportation demand will play in the development of Navarin Basin. Air transportation demand at St. Matthew will also be

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significant since it is the main support base within helicopter range of offshore installations. The transportation of personnel to these installations will require that they all transfer through St. Matthew. Traffic to St. Matthew can be flown directly from Anchorage, or can come via Cold Bay, with direct connections to Seattle or to Anchorage. The assumptions provided to the Consultant by the MMS and used for air support of the offshore activities are:

<u>YEAR</u>	<u>PHASE</u>	<u>TRAFFIC SPLIT</u>
1984-1991	Exploration and Development Phases:	1) 75% St. Matthew via Cold Ba 2) 25% St. Matthew via Anchors
1992-2000	<b>production Phase:</b>	1) 50% St. Matthew <b>via</b> Cold Ba 2) 50% St. Matthew via Anchors

Until 1985, Cold Bay will serve as the main transfer point for air traffic going to Dutch Harbor. Air traffic going to the oil terminal on the southern coast of the Alaska Peninsula will also be served by Cold Bay.

The enclave personnel are expected to work two weeks on and two weeks off. This would result in a total of 28 trips a year or 14 round trips. The increased resident population will also have a high propensity to travel, although their propensity will be less than enclave personnel. One person working offshore and traveling via Cold Bay and St. Matthew would result in the following number of annual enplanements.

- . at Anchorage - 14
- . at Cold Bay - 28
- . at St. Matthew - 28
- . at offshore site - 14

If 75 percent of air trips are routed through Cold Bay, the number of Cold Bay enplanements would be adjusted to 21. Similarly, if 50 percent of these trips are routed through Cold Bay, enplanements would be 14. As previously indicated, all trips with an origin or destination in Unalaska-Dutch Harbor would have a final destination or origin in Anchorage, and would

generate the following number of annual enplanements for enclave personnel:

- . at Anchorage - 14
- . at Cold Bay - 28
- . at Unalaska-Dutch Harbor - 14

Air freight enplanements are assumed to be 10 percent of the OCS dry consumables. Based on these assumptions air passenger and air cargo enplanements and air operations related to OCS development can be estimated for each impacted community.

### Unalaska-Dutch Harbor

Using the trip frequency assumptions presented earlier and the additional resident and enclave populations, the number of enplanements estimated for Unalaska-Dutch Harbor are presented in Table 62. Freight enplanements at Dutch Harbor are expected to be minimal and are estimated to be on the order of magnitude of 5 percent of the enplaned air cargo without the development of the Navarin Basin.<sup>a</sup> Airmail shipments will also increase slightly as a result of the enclave population and the following subsidized rates for this service. Per capita rates with OCS development are assumed to be the same as without this activity.

The increase in air operations at Unalaska-Dutch Harbor as a result of OCS activities will be related to the number of enplanements associated with that activity. The number of enplaned passengers per air operation is assumed to be the same with OCS development as without it. Since the fleet operating from Unalaska-Dutch Harbor is not likely to change as a result of OCS activities, air carrier activities are expected to accommodate 95 percent of the enplaned OCS passengers. The remainder are assumed to use air taxis. Earlier studies for the St. George Basin (Peat, Marwick, Mitchell and Co., 1981) allocated 10 percent for air taxis; however, the more remote nature of the Navarin Basin provides less opportunity for smaller aircraft with shorter ranges to develop a sizeable share of this market. General aviation will increase in proportion to overall

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<sup>a</sup>Deplaned cargo would be much higher than the plus or minus 5 percent indicated here.

## AIR PASSENGER AND AIRCARGO ENPLANEMENTS AT UNALASKA-DUTCH HARBOR

## NAVARIN BASIN (LEASE SALE 83) - IMPACT OF OCS DEVELOPMENT

YEARS		PASSENGER ENPLANEMENT OCS IMPACT					AIRCARGO ENPLANEMENT - OCS IMPACT						
BASE CASE		BASE CASE					BASE CASE						
CALENDAR	AFTER	PASSENGER	AIR	AIRTAXI	AIR	GRAND	TOTAL	AIRCARGO	AIR		TOTAL	GRAND	TOTAL
YEAR	SALE	ENPLANEMENT	CARRIER <sup>a</sup>	COMMUTER <sup>b</sup>	TRAFFIC <sup>c</sup>	WITH	OCS	(T O N S)	FREIGHT <sup>d</sup>	AIRMAIL <sup>e</sup>	(T O N S) <sup>f</sup>	WITH	OCS
1981		11,860				11,860		229					229
1982		12,860				12,860		195					195
1983		13,950				13,950		209					209
1984	0	15,120				15,120		244					244
1985	1	16,400	3,498	184	3,682	20,082		239	47	8	55		294
1986	2	17,780	2,101	111	2,212	19,992		256	28	5	33		289
1987	3	19,290	3,298	174	3,472	22,762		275	45	7	52		327
1988	4	201,910	3,538	186	3,724	24,634		294	48	8	56		350
1989	5	22,680	4,096	216	4,312	26,992		316	55	9	64		380
1990	6	24,590	3,099	163	3,262	27,852		338	42	7	49		387
1991	7	26,670	2,833	149	2,982	29,652		362	38	6	45		407
1992	8	28,920	3,591	189	3,780	32,700		388	49	8	56		444
1993	9	31,360	5,520	291	5,810	37,170		416	75	12	87		503
1994	10	34,000	7,089	373	7,462	41,462		446	96	16	112		558
1995	11	42,500	7,927	417	8,344	50,844		513	107	17	125		638
1996	12	46,070	7,900	416	8,316	54,386		550	107	17	124		674
1997	13	49,940	7,528	396	7,924	57,8964		590	102	17	118		708
1998	14	54,130	6,956	366	7,322	61,452		631	94	15	109		740
1999	15	58,680	6,730	354	7,084	65,764		670	91	14	105		775
2000	16	63,610	6,743	355	7,098	70,708		712	91	14	105		817

<sup>a</sup>[(Additional Resident Population) + (Enclave Population)] = Additional OCS population x 28 x .5 x .95

<sup>b</sup>(Additional OCS Population) x 28 x .5 x .05

<sup>c</sup>Sum of 1 and 2

<sup>d</sup>(0.015 ton/m.d.) (Additional OCS Population) x 12 months

<sup>e</sup>[(Airmail Tonnage without OCS) / (Resident Pop. without OCS)] x (Additional OCS Pop.)

<sup>f</sup>Sum of 4 and 5

Source: Louis Berger & Associates, Inc.

air activities. Unalaska-Dutch Harbor air operations and the assumptions used to generate these figures are presented in Table 63.

### Cold Bay

Cold Bay is expected to act as the principal center of air activities in the Aleutian Region through 1995 when the extension of the Unalaska-Dutch Harbor airport is completed. With the longer runway, a direct connection by jet between Anchorage and Unalaska-Dutch Harbor will make an overfly of Cold Bay possible. Despite this development, Cold Bay will continue to remain a center of OCS air support for the Navarin Basin.

Using the assumptions presented earlier, the number of enplaned passengers are estimated for Cold Bay in Table 64. Enplaned cargo is estimated based on the assumption that during the exploration and construction phases 7.5 percent of the OCS dry consumables will move by air to St. Matthew and other offshore areas.

Air operations from Cold Bay assume the same enplanement passenger-to-air operation ratio experienced without the development of Navarin Basin for air carriers. This value varies from 14 to 18 passengers per operation over the forecast period.<sup>a</sup> Similarly 95 percent of the enplaned passengers are assumed to use air carriers and 5 percent air taxis. General aviation generated at Cold Bay will be higher in percentage terms (5%) than at Unalaska-Dutch Harbor due to the relative proximity of Cold Bay to the oil terminal and other OCS activities. Air charter traffic carrying air freight will also contribute a sizeable proportion of air traffic operation. It should be noted that jet operators between Cold Bay and St. Matthew are expected to occur after 1991. Because of the dedicated service between these destinations, it is anticipated that high load factors can be achieved, e.g., 90 passengers per trip. Cold Bay air operations estimates and the assumptions used to generate them are presented in Table 65.

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<sup>a</sup>Except as noted below, e.g., after 1991 for service between Cold Bay and St. Matthew.

TABLE 63  
AIR OPERATIONS AT UNALASKA - DUTCH HARBOR  
 NAVARIN BASIN (LEASE SALE 83) - IMPACT OF OCS DEVELOPMENT

CALENDAR YEAR	YEAR AFTER SALE	BASE CASE	AIR OPS WITH OCS IMPACT				GRAND AIR OPS DEVELOPMENT	TOTAL WITH OCS
			AIR CARRIER <sup>a</sup>	AIR TAXI / COMMUTER <sup>b</sup>	GENERAL AVIATION <sup>c</sup>	TOTAL Ocs		
1981		1,168					1,168	
1982		1,270					1,270	
1983		1,930					1,930	
1984	0	2,053					2,053	
1985	1	2,159	198	58	13	269	2,428	
1986	2	2,299	121	35	8	164	2,463	
1987	3	2,454	195	54	12	261	2,715	
1988	4	2,074	213	58	14	284	2,358	
1989	5	2,256	251	67	16	334	2,590	
1990	6	2,461	194	51	12	257	2,718	
1991	7	2,677	180	47	11	238	2,915	
1992	8	2,915	232	59	15	305	3,220	
1993	9	3,173	362	91	23	475	3,648	
1994	10	3,457	473	117	29	619	4,076	
1995	11	2,710	198	130	16	345	3,055	
1996	12	2,920	198	130	16	344	3,264	
1997	13	3,150	188	124	16	328	<b>3,478</b>	
1998	14	3,398	174	114	14	303	3,701	
1999	15	2,664	168	111	14	293	2,957	
2000	16	3,954	169	<b>111</b>	14	294	4,248	

<sup>a</sup>(Air carrier operations without OCS impact) / (Air carrier passengers without OCS impact) x (OCS Passenger Enplanements) x .95

<sup>b</sup>.05 x OCS Passenger Enplanements / 3.2

<sup>c</sup>Sum of Air Carrier and Airtaxi x 0.05

Source: Louis Berger & Associates, Inc.

TABLE 6 4

## AIR PASSENGER AND AIR CARGO ENPLANEMENTS AT COLD BAY

## NAVARIN LEASE SALE 83 - IMPACT OF OCS DEVELOPMENT

		PASSENGER ENPLANEMENTS					AIR CARGO ENPLANEMENTS					
YEARS		ADDITIONAL OCS TRAFFIC					ADDITIONAL OCS TRAFFIC					GRAND
CALENDAR	AFTER	BASE	AIR	AIR TAXI	TOTAL	GRAND	BASE	AIR	AIR	TOTAL		
YEAR	SALE	CASE	CARRIER <sup>a</sup>	COMMUTER <sup>b</sup>	TRAFFIC	TOTAL	CASE	FREIGHT	MAIL <sup>e</sup>	AIR CARGO <sup>f</sup>	AIR CARGO	
1981		28,200				28,200	812				812	
1982		30,050				30,050	853				853	
1983		32,000				32,000	896				896	
1984	0	34,090				34,090	942				942	
1985	1	36,310	7,68 <sup>b</sup>	404 <sup>d</sup>	8,085	44,395	990	8	1	9	999	
1986	2	38,660	9,150	482	9,632	48,292	1,041	43	4	47	1,088	
1987	3	41,170	16,033	844	16,877	58,047	1,094	98	10	108	1,202	
1988	4	43,850	17,410	916	18,326	62,176	1,151	110	11	120	1,271	
1989	5	46,700	24,711	1,301	26,012	72,712	1,209	192	19	211	1,420	
1990	6	49,740	17,290	910	18,200	67,940	1,271	119	12	130	1,401	
1991	7	52,970	27,119	1,427	28,546	81,516	1,336	127	13	140	1,476	
1992	8	56,410	67,019	3,527	70,546	126,956	1,406	724	72	796	2,202	
1993	9	60,080	91,517	4,817	96,334	156,414	1,479	940	94	1,034	2,513	
1994	10	63,980	85,745	4,513	90,258	154,238	1,555	701	70	771	2,326	
1995	11	51,190	70,304	3,700	74,044	125,194	1,263	824	82	906	2,169	
1996	12	53,740	67,564	3,556	71,120	124,860	1,329	727	73	800	2,129	
1997	13	56,430	67,963	3,577	71,540	127,970	1,399	678	68	746	2,145	
1998	14	59,250	62,603	3,295	65,898	125,148	1,471	606	61	666	2,137	
1990	15	65,150	54,464	2,867	57,330	122,480	1,549	510	51	562	2,111	
2000	16	68,590	43,145	2,271	45,416	114,006	1,629	422	42	464	2,093	

<sup>aa.</sup> (Dutch Harbor OCS pop.) X 28 + (Cold Bay OCS pop.) \* 28 X .5 + (St. Matthew Pop.) X 28 X 1/2 year X 75% allocation + (Remote Aleutian Site pop.) X 28 X .5 + (Offshore pop.) X 28 X 1/2 year X 75% allocation.

<sup>b.</sup> In 1992 6 months changes to 12 months and 75% allocation to 50%; all else remains the same.

<sup>b95</sup> percent of total traffic.

<sup>c</sup> 5 percent of total traffic.

<sup>da</sup> .015 tons/month X 12 months / (OCS pop. of Dutch Harbor and Remote Aleutian Locations) + .015 tons/month X 6 months X 75% allocation (St. Matthew and Offshore populations).

<sup>f</sup> Airmail 10% of air freight.

<sup>f.1.</sup>

SOURCE : Louis Berger & Associates, Inc.

TABLE 65

AIR OPERATIONS AT COLD BAY**NAVARIN BASIN (LEASE SALE 83) - IMPACT OF OCS DEVELOPMENT**

CALENDAR YEAR	YEAR		ADDITIONAL OCS AIR OPERATIONS					GRAND TOTAL
	AFTER SALE	EASE CASE	AIR CARRIER <sup>a</sup>	AIR TAXI/ COMMUTER <sup>b</sup>	GENERAL AVIATION <sup>c</sup>	AIR CARGO CHARTER <sup>d</sup>	TOTAL	GRAND TOTAL
1981		3,450						3,450
1982		3,630						3,630
1983		6,750						6,750
1984	0	6,950						6,950
1985	1	7,170	531	126	3	4	695	7,865
1986	2	7,410	627	151	39	21	838	8,248
1987	3	7,650	1,086	264	67	49	1,466	9,116
1988	4	5,000	1,170	286	73	55	1,584	6,584
1989	5	5,270	1,643	406	102	<b>96</b>	2,248	7,518
<b>1990</b>	6	5,560	1,139	284	71	59	1,533	7,113
1991	7	5,860	1,769	446	111	64	2,390	8,250
1992	8	6,190	1,989	1,102	272	362	3,608	9,798
<b>1993</b>	9	<b>6,530</b>	<b>2,693</b>	<b>1,505</b>	<b>368</b>	<b>470</b>	<b>4,873</b>	<b>11,408</b>
1994	10	6,890	2,534	<b>1,410</b>	343	351	4,492	11,382
1995	<b>11</b>	5,280	2,553	1,156	267	412	4,306	9,586
1996	12	5,580	<b>2,491</b>	<b>1,111</b>	255	364	4,146	9,726
1997	13	5,890	2,450	<b>1,118</b>	256	339	4,085	9,975
1998	14	6,230	2,262	<b>1,030</b>	235	303	3,759	9,989
1999	15	6,580	2,007	896	<b>196</b>	255	3,303	9,883
2000	16	6,960	1,754	710	155	211	2,798	<b>9,758</b>

<sup>a</sup>Air Carrier Passengers/Number of passengers per operation with OCS activities)

<sup>b</sup>Air taxi/Commuter Passengers/3.2 passengers per operation (based on present data)

<sup>c</sup>General Aviation= 0.05 of Air Carrier and Air taxi operations.

<sup>d</sup>Air Cargo/ 2 tons per operation.

Source: Louis Berger & Associates, Inc.

## St. Matthew

St. Matthew will be the main service point **for** all offshore activities. In addition to fixed wing aircraft, st. Matthew will serve helicopters conveying supplies and personnel initially to exploration sites and eventually to production platforms. It will also be the main air resupply center for offshore construction.

Estimates of **enplanements** at St. Matthew were made in the same **manner as estimates of enplanements** at **Unalaska-Dutch Harbor and Cold Bay**. Yearly passenger enplanement estimates were derived by relating St. Matthew onshore and offshore employment and the number of trips made per year for both. Air cargo enplanements were related to St. Matthew onshore and offshore employment in association with the number of wells **being developed**. **Air passenger and cargo enplanements at St. Matthew and the related assumptions and tonnage factors** used to calculate enplanements are presented in Table 66.

Helicopter trip estimates are based **on the** assumption that one trip per day is made to exploration rigs or production platforms through 1994 and that after 1994 when production is under way, trip frequency will decrease over a five year period to once every two days. It is assumed that exploration-related trips will occur over a half year period, whereas **production-related** trips will be generated over the entire year. The number of rigs, platforms, trips, frequency and total helicopter trips are presented in Table 67.

Air operations for St. Matthew as presented in Table 68, are derived for 1991 assuming the same operations-to-passenger ratio used for Cold Bay in conjunction with the passenger **enplanement** data presented in Table 66. After 1991, jet operations at St. Matthew will carry an average of 90 passengers in each direction. It is assumed that 95 percent of enplaned passengers will use air carriers, 5 percent air taxis. General aviation operations are assumed to be 2.5 percent of air carrier and air taxi operations. Air charter cargo operations are estimated assuming that two tons of the total cargo tonnage estimated to move to St. Matthew is moved for each air cargo operation. Helicopter operations mentioned in the previous paragraph are estimated by doubling the number of estimated trips.

## AVIATION SYSTEM IMPACTS

### Capacity Effects

The major effects of increases in air traffic due to OCS development in the Navarin Basin will occur on runway capacity, terminal capacity or storage space. For all three airports impacted by Navarin Basin activity, none will be impacted significantly. A discussion of each facility is presented below.

**Unalaska-Dutch Harbor.** The airport's air operations are expected to increase between 7 and 15 percent as a result of OCS activity. These increases are relatively minor in terms of current runway, terminal and storage capacity. Further, **Unalaska-Dutch Harbor** is scheduled for a runway expansion which would increase throughput capacity. For these reasons OCS related air traffic impacts will have little effect on the airport capacity.

**Cold Bay.** This facility's air operations and enplanements are expected to increase over 100 percent by 1992 as a result of Navarin Basin activity. However, facilities at Cold Bay are the best in the region. Two runways and turnaround areas at both ends of each, as well as extensive paved aircraft parking, allow for event OCS related traffic to be easily accommodated. Storage facilities, although antiquated, are extensive and could easily handle additional air freight and cargoes associated with OCS related traffic. Although passenger terminals are currently cramped, there is ample space in the airport area suitable for development. Further, private carriers would logically expand current facilities should it be warranted by an increase in passenger traffic. Therefore, OCS aviation system impacts at Cold Bay are expected to be negligible.

**S t .Matthew.** This island currently has no airport facilities. As any development of the aviation system would be directly related to OCS activity, it is assumed that the industry design and development of these facilities will allow for adequate capacity. Aviation system impacts are, therefore, not relevant to this case, except as a land use change on the island with its associated impacts.

TABLE 66

AIR PASSENGER AND AIRCARGO ENPLANEMENTS AT ST. MATTHEW AND  
FOR OFFSHORE DESTINATIONS

**NAVARIN BASIN (LEASE SALE 83) - IMPACT OF OCS DEVELOPMENT**

CALENDAR YEAR	YEARS AFTER SALE	PASSENGER ENPLANEMENTS		AIR CARGO	
		ST. MATTHEW TRAFFIC <sup>a</sup>	OFFSHORE TRAFFIC <sup>b</sup>	ST. MATTHEW <sup>c</sup>	OFFSHORE <sup>d</sup>
1981					
1982					
1983					
1984	0				
1985	1	35	0	1	
1986	2	7,518	3,360	47	37
1987	3	18,823	8,960	109	98
1988	4	21,084	10,080	122	110
1989	5	21,126	10,080	122	110
1990	6	14,448	6,720	86	73
1991	7	40,411	19,544	158	141
1992	8	102,886	44,744	379	293
1993	9	144,396	64,652	1,097	903
1994	10	139,678	65,464	1,098	986
1995	11	135,674	63,028	1,194	1,070
1996	12	129,066	59,514	1,062	933
1997	13	129,906	59,934	1,016	887
1998	14	118,622	54,292	907	778
1999	15	101,486	45,724	757	628
2000	16	77,658	33,810	592	463

<sup>a</sup>1985 thru 1991 (St. Matthew Employment) x 28 x  $\frac{1}{2}$  year x 0.5 + (Offshore Employment) x 28 x  $\frac{1}{2}$  x 1. 1992 thru 2000 (St. Matthew Employment) x 28 x  $\frac{1}{2}$  year x 1 + (Offshore Employment) x 28 x 1 x 1.

<sup>b</sup>1985 thru 1991 (Offshore Equipment) x 28 x  $\frac{1}{2}$  year x 1. 1992 thru 2000 (Offshore Equipment) 28 x 1 x 1.

<sup>c</sup>1985 thru 1992 (St. Matthew Employment + Offshore Employment) x 0.15/ton/person/month x 6 months + (No. wells x 5 tons).

<sup>d</sup>1993 thru 2000 (St. Matthew Employment + Offshore Equipment) x 0.15 ton/person/month x 12 months + (No. wells x 4 tons).

Source: Louis Berger & Associates, Inc.

TABLE 67

ST. MATTHEW - HELICOPTER TRIPS**NAVARIN** BASIN LEASE SALE 83 - IMPACT **OF** OCS DEVELOPMENT

YEARS	RIGS	RIGS AND NO. OF TRIPS				TOTAL TRIPS
		PLATFORMS	PLATFORMS @ 180 DAYS	NO TRIPS @ 365 DAYS		
1984						
1985						
1986	1		1	180	180	
1987	3		3	540	540	
1988	3		3	540	540	
1989	3		3	540	540	
1990	2	2	4	360	730	1,090
1991	1	5	6	180	1,825	2,005
1992		9	9		3,285	3,885
1993		12	12		4,380	4,380
1994		13	13		4,745	4,745
1995		13	13		4,130	4,130
1996		13	13		3,595	3,595
1997		13	13		3,130	3,130
1998		13	13		2,725	2,725
1999		13	13		2,372	2,372
2000		13	13		2,372	2,372

## Notes:

1. **Maximum** reached in 1994 with 1 trip per day per platform; once in production **the** trips will taper off to 1 trip every 2 days. This drop in demand will occur over a five year period.
2. Exploration rigs will operate for half-year (180 days).
3. Platforms will operation year round.

TABLE 68

AIR OPERATIONS AT ST. MATTHEW  
**NAVARIN BASIN** (LEASE SALE 83) - IMPACT OF OCS DEVELOPMENT

CALENDAR YEAR	YEARS AFTER SALE	AIR OPS WITH OCS IMPACT					TOTAL
		AIR CARRIER <sup>a</sup>	AIR TAXI/ COMMUTER <sup>b</sup>	GENERAL AVIATION <sup>c</sup>	AIR CHARTER CARGO <sup>d</sup>	HELI- COPTER <sup>e</sup>	
1981							
1982							
1983							
1984	0						
1985	1	2	1	0	0		3
1986	2	490	65	14	23	360	952
1987	3	1211	154	34	55	1080	2534
1988	4	1346	172	38	61	1080	2697
1989	5	1335	173	38	61	1080	2686
1990	6	904	121	26	43	2180	3273
1991	7	2505	326	71	79	4010	6990
1992	8	1227	908	53	189	6570	8949
1993	9	1683	1246	73	549	8760	12311
1994	10	1567	1160	68	549	9490	12834
1995	11	1534	1135	67	597	8260	11592
1996	12	1468	1087	64	531	7190	10340
1997	13	1477	1093	64	508	6260	9403
1998	14	1358	1005	59	454	5450	8326
1999	15	1177	871	51	378	4745	7223
2000	16	926	685	40	296	4745	6692

<sup>a</sup>1985 to 1991 (St. Matthew Passenger Enplanements - Offshore Enplanements x .95/ Cold Bay passengers per operation.

<sup>b</sup>1992-2000 St. Matthew Passenger enplanement x .05 / 3.2 passengers per operation.

<sup>c</sup>Sum of Air Carrier and Airtaxi operations x 0.025.

<sup>d</sup>Cargo tonnage / 2 tons per operation.

<sup>e</sup>Helicopters: total number of trips x 2.

Source: Louis Berger & Associates, Inc.

CHAPTER VI  
CONCLUSIONS

## VI. CONCLUSIONS

The major transportation impacts of the Navarin Basin oil and gas development activities are expected to be:

- o A new service base port, heliport, and oil terminal on St. Matthew Island, if this type of land use is allowed.
- o A significant increase in Dutch Harbor port traffic, which in the development (construction) phase will require either new infrastructure or a joint operation of the present four dock system to reduce delays. Improved handling methods and equipment would undoubtedly be required, if oil and gas are discovered.

Vessels arriving in Dutch Harbor will experience significant delays in 1992 until improvements can be made.

- o A new oil terminal on the Southern Alaska Peninsula if oil is discovered in economic quantities.
- o Significant but still manageable increases in marine traffic to Cold Bay and air traffic to both Unalaska-Dutch Harbor and Cold Bay. Neither of these will require additional infrastructure.
- o Increases in both marine and air cargo fleets serving the Aleutian Chain. Supply boats and barges will be the major new vessels.
- o Additional pressure to lengthen the Dutch Harbor Airport to handle jet traffic.

In general, the transportation system will feel a significant change in Dutch Harbor, Cold Bay and at St. Matthew. Some associated increases will also be felt in Anchorage, but as only a small proportion of Base Case traffic.

APPENDIX A: **ORIGIN AND DESTINATION TABLES**

1979 TOTAL THROUGHPUT TONNAGE - 580,057

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1979 - Inbound Tonnage to Iliuliuk Harbor

<u>Commodity</u>	<u>Origin</u>	<u>Amount of Tonnage</u>
<b>Farm Products</b>	Foreign	1
	Seattle	2
Fresh Fish	Foreign	8
	King Cove	17
	Aleutians	36
	Ketchikan	34
	Kodiak	619
	Sitka	531
	Seattle	235
Non-Metallic Minerals	Foreign	206
	Kodiak	664
	Sitka	508
	Seattle	520
Food	Foreign	298
	Cordova	3
	Kodiak	127
	Sitka	327
	Seattle	168
<b>Basic Textiles</b>	Foreign	16
	Seattle	1982
Apparel	Foreign	330
Lumber/Wood	Foreign	271
	Aleutians	97
	Kodiak.	313
	Si tka	258
	Seattle	1768
<b>Furniture/Fixtures</b>	Foreign	94
	Si tka	9
printed Matter	Foreign	3
Chemical s	Foreign	1583
	Seattle	2

1979 - Inbound Tonnage to Iliuliuk Harbor

<u>Commodity</u>	<u>Origin</u>	<u>Amount of Tonnage</u>
Petroleum	Local	96,193
	Foreign	1
	Kenai	16,413
	Alaska, So. Side	14,608
	Valdez	12,879
	Kodiak	21
	Sitka	69
	Seattle	2,467
	Richmond, CA	202,580
Rubber	Foreign	78
Stone, Clay	Foreign	216
	Seattle	30
	Sitka	8
Primary Metals	Foreign	4
	Seattle	42
Fabricated Metals	Foreign	207
	Seattle	4,681
	Sitka	74
Machinery	Foreign	94
	Anchorage	175
	Kodiak	25
	Seattle	1,140
Electrical Machinery	Foreign	439
	Seattle	24
Transportation	Foreign	5
	Kodiak	21
	Sitka	18
	Seattle	156
	Alaska, North Side	60
Paper/Pulp	Foreign	349
	Kodiak	1,750
	Sitka	395
	Seattle	390

197'3 - Inbound Tonnage to Iliuliuk Harbor

<u>Commodity</u>	<u>Origin</u>	<u>Amount of Tonnage</u>
Miscellaneous	Forei gn	218
	Anchorage	90
	Kodi ak	49
Leather	Forei gn	131
Instruments	Forei gn	24
Speci al i tems	Forei gn	7
	Anchorage	1
	Kodi ak	2,500
	Sitka	213
	Seattl e	750

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1979- Outbound Tonnage from Iliuliuk Harbor

<u>Commodity</u>	<u>Desti nation</u>	<u>Amount of Tonnage</u>	
Fresh Fi sh	Forei gn	37, 721	
	Seattl e	484	
	<b>Sitka</b>	382	
	Kodi ak	976	
Coal	Kodi ak	5	
Food	Forei gn	4, 811	-
	Seattl e	3, 787	
	Kodi ak	9, 843	
Petrol eum	Naknek	21, 831	
	<b>Pribilof</b>	3, 613	
	Alaska, North Si de	9, 866	
	Homer	1, 669	
	Alaska, So. Si de	9, 142	
	<b>Dillingham</b>	12, 193	
	Beri ng Sea	33, 245	
	King Cove	<b>399</b>	
	Al euti ans	7, 953	
	N ome	10, 708	
	<b>Seldovia</b>	141	
	Bethel	32, 225'	
	St. Mi chael	7, 402	
Rubber	Forei gn	45	
Prim ary Metals	Forei gn	99	
Fabri cated Metals	<b>Sitka</b>	8	
Machi nery	Forei gn	3	
	<b>Sitka</b>	215	
Transportati on	Forei gn	3	
	Kodi ak	7	
	Al euti ans	61	
Paper/Pul p	Kodi ak	15	

1979 - Outbound Tonnage from Iliuliuk Harbor

<u>Commodity</u>	<u>Destination</u>	<u>Amount of Tonnage</u>
Miscellaneous	Kodiak	51
Special Items	Seattle	179
	Sitka	217
	Kodiak	130

1980 TOTAL THROUGHPUT TONNAGE - 483,946

1980- Inbound Tonnage to Iliuliuk Harbor

<u>Commodity</u>	<u>Origin</u>	<u>Amount of Tonnage</u>	
Farm Products	Foreign	45	
Fresh Fish	Seattle	46	
	<b>Sitka</b>	610	
	Kodiak	43	
	Petersburg	6	2
	Alutians	332	
	Alaska, North Side	160	
Non-Metallic Minerals	Foreign	971	
	Seattle	1,307	
	Sitka	630	
	Kodiak	122	
Food	Foreign	352	
	Seattle	735	
	<b>Sitka</b>	1,257	
	Kodiak	62	
Basic Textiles	Foreign	57	
Apparel	Foreign	219	
Lumber/wood	Foreign	783	
	Seattle	74	
	<b>Sitka</b>	305	
	Kodiak	18	
Furniture/Fixtures	Foreign	8	
	Seattle	2	
	<b>Sitka</b>	2	
Pulp/Paper	Foreign	122	
	Seattle	796	
	<b>Sitka</b>	755	
	Kodiak	470	
Printed Matter	Foreign	30	
Chemicals	Foreign	62	
	Seattle	6	
	<b>Sitka</b>	20	

1980 - Inbound Tonnage to Iliuliuk Harbor

<u>Commodity</u>	<u>Origin</u>	<u>Amount of Tonnage</u>
Petroleum	Seattle	21,730
	Sitka	500
	Alaska, So. Side	1,195
	Richmond, CA	178,166
	Kenai	18,162
Rubber	Foreign	82
Leather	Foreign	91
Stone/Clay	Foreign	58
	Seattle	50
	Sitka	111
Primary Metals	Foreign	6,158
Fabricated Metals	Foreign	74
	Seattle	720
	Sitka	502
	Kodiak	25
Machinery	Foreign	45
	Seattle	685
	Sitka	54
	Alaska, So. Side	55
Electrical Machinery	Foreign	235
Transportation	Seattle	23
	Sitka	64
	Kodiak	3
Miscellaneous	Foreign	880
	Kodiak	300
	Anchorage	36
Special Items	Foreign	12
	Seattle	2,386
	Sitka	509
	Kodiak	283
	Alutians	237
	Anchorage	15

1980- Inbound Tonnage to Iliuliuk Harbor

<u>Commodity</u>	<u>Origin</u>	<u>Amount of Tonnage</u>
Instruments	Foreign	29

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1980 - Outbound Tonnage from Iliuliuk Harbor

<u>Commodity</u>	<u>Destination</u>	<u>Amount of Tonnage</u>
Fresh Fish	Foreign	19,437
	Seattle	471
	Sitka	240
	Kodiak	29
Food	Foreign	2,130
	Seattle	6,971
	Sitka	4,774
	Kodiak	927
	Alaska, No. Side	85
	Homer	980
Lumber/Wood	Aleutians	27
Pulp/Paper	Seattle	4
Chemicals	Foreign	4
	Seattle	4
Petroleum	Kodiak	1,071
	Alaska, So. Side	6,391
	Bering Sea	34,710
	Alaska, No. Side	6,404
	Naknek	21,748
	Aleutians	13,214
	Dillingham	5,602
	Pribilof	3,666
	King Cove	1,358
	Nome	16,303
	Old Harbor, AK	22
	Bethel	44,387
	St. Michaels	7,971
	Prince William Sound	80
	McGrath	332
	Local	38,007
Fabricated Metals	Seattle	7
	Sitka	7
Machinery	Sitka	52
Electrical Machinery	Seattle	2

1980 - Outbound Tonnage from Iliuliuk Harbor

<u>Commodity</u>	<u>Destination</u>	<u>Amount of Tonnage</u>
Transportation	<b>Seattle</b>	20
	<b>Sitka</b>	2
Waste/Scrap	Foreign	22
Miscellaneous	Anchorage	25
<b>Special Items</b>	Seattle	1,989
	Kodiak	147
	<b>Sitka</b>	110
	Bering Sea	7
	Anchorage	12
	Nome	57

APPENDIX B: **SCIMP** 162 AND 163 OUTPUTS

TABLE 1: POPULATION

Run #3

SIMP/163 6/25/82 1:30PM S

YEAR	BRESPOP	ENCLV	TANRFISH	PMIL	PTOTAL1	PTOTAL2	PTOTAL3
1981	4208.	1656.	717.	3894.	5864.	6581.	10475.
1982	4401.	1657.	774.	3894.	6057.	6831.	10725.
1983	4571.	1743.	911.	3894.	6314.	7226.	11120.
1984	4730.	1791.	1093.	3894.	6521.	7614.	11508.
1985	4875.	1817.	1280.	3894.	6692.	7972.	11866.
1986	5005.	1797.	1474.	3894.	6802.	8276.	12170.
1987	5121.	1751.	1677.	3894.	6872.	8548.	12442.
1988	5226.	1677.	1889.	3894.	6902.	8792.	12686.
1989	5337.	1685.	2035.	3894.	7022.	9057.	12951.
1990	5448.	1696.	2116.	3894.	7144.	9260.	13154.
1991	5567.	1710.	2216.	3894.	7278.	9494.	13388.
1992	5701.	1730.	2340.	3894.	7431.	9771.	13665.
1993	5857.	1756.	2492.	3894.	7614.	10106.	14000.
1994	6046.	1792.	2680.	3894.	7838.	10518.	14412.
1995	6278.	1838.	2910.	3894.	8116.	11026.	14920.
1996	6571.	1901.	3190.	3894.	8471.	11662.	15556.
1997	6944.	1984.	3532.	3894.	8929.	12461.	16355.
1998	7428.	2095.	3946.	3894.	9524.	13470.	17364.
1999	8063.	2243.	4447.	3894.	10306.	14753.	18647.
2000	8822.	2440.	4473.	3894.	11262.	15736.	19630.

BRESPOP ; RESIDENT POPULATION

ENCLV ENCLAVE POPULATION  
 TANRFISH NONRESIDENT FISHERMEN  
 PMIL MILITARY POPULATION  
 PTOTAL1 TOTAL POPULATION EXCLUDING NONRESIDENT  
 PTOTAL2 FISHERMEN AND MILITARY  
 TOTAL3 TOTAL POPULATION EXCLUDING MILITARY  
 TOTAL4 TOTAL POPULATION

SE/MR/16.2 6/25/82 1.3

RUN #3

TABLE 2: RESIDENT EMPLOYMENT

YEAR

Residual  
Bottom  
Subsistence  
EMPRV

Bottom  
Fish  
Processing  
EMPRON

Traditional  
Fish  
Res. Emplo  
TRFHEMP

Traditional  
Processing  
Res. Emplo  
TRFFEMP

REMP5 B

Other Basic  
Sector Employ  
NFREMP

Support  
Sector  
Employment  
EMSI

Government  
Employment  
EMG1

1981	24.	1.	251.	174.	0	11.	452.	1144.
1982	30.	1.	251.	174.	0	11.	459.	1175.
1983	45.	2.	251.	174.	9	11.	475.	1197.
1984	66.	3.	251.	174.	15	11.	497.	1216.
1985	87.	4.	251.	174.	17	11.	497.	1233.
1986	109.	6.	251.	174.	15	11.	501.	1249.
1987	132.	9.	251.	174.	9	11.	502.	1263.
1988	156.	12.	251.	174.	0	11.	500.	1274.
1989	173.	18.	251.	174.	0	11.	506.	1286.
1990	183.	25.	251.	174.	0	11.	512.	1298.
1991	196.	35.	251.	174.	0	11.	520.	1310.
1992	213.	50.	251.	174.	0	11.	529.	1323.
1993	234.	71.	251.	174.	0	11.	541.	1338.
1994	260.	101.	251.	174.	0	11.	557.	1355.
1995	294.	142.	251.	174.	0	11.	577.	1376.
1996	336.	201.	251.	174.	0	11.	605.	1402.
1997	390.	283.	251.	174.	0	11.	641.	1434.
1998	459.	398.	251.	174.	0	11.	690.	1476.
1999	547.	560.	251.	174.	0	11.	755.	1530.
2000	595.	787.	251.	174.	0	11.	832.	1601.

48.2

EMPRV  
EMPRON  
TRFHEMP  
TRFFEMP  
KSGSEMP  
NFREMP  
EMSI  
EMG1

RESIDENT BOTTOMFISHERMEN  
BOTTOMFISH PROCESSING RESIDENT EMPLOYMENT  
TRADITIONAL FISHING RESIDENT EMPLOYMENT  
TRADITIONAL PROCESSING RESIDENT EMPLOYMENT  
ST. GEORGE SALE RESIDENT EMPLOYMENT  
OTHER BASIC SECTOR RESIDENT EMPLOYMENT  
SUPPORT SECTOR EMPLOYMENT  
GOVERNMENT EMPLOYMENT

Ex 1 mp 162 6/25/82 1:30 p

Total Employment

Other  
Enclave  
Employment  
NFEENF

343301

1133 FM

55  
56  
57  
58  
59  
60

HS 133

APR 25 1964

HAIR  
TAPER

**Excluded**  
1001-1000

5/19/2004 14:17

[illegible]

TEFFEMP	TRADITIONAL PROCES
	SING ENCLAVE EMPLOYMENT
EMPNNRON	[BOTTOMFISH PROCESSING ENCLAVE EMPLOYMENT
TFFNNREMP	TOTAL PROCESSING ENCLAVE EMPLOYMENTS
TNNRFISH	TRADITIONAL FISHING NONRESIDENTS
EMPNNRV	BOTTOMFISHING NONRESIDENT FISHERMEN
TNNRFISH	TOTAL NONRESIDENT FISHERMEN
ESGSEMP	ST. GEORGE SALE ENCLAVE EMPLOYMENT ?
NFEEMP	OTHER ENCLAVE EMPLOYMENT
TOEMP	TOTAL EMPLOYMENT

TABLE 4: TOTL. EMPLOYMENT

4 IN #3

YEAR	EMX	EMS1	EMG1	ENCLV	TONRFISH	EMIL	TOEMP1	TOEMP2	TOEMP3	TOEMP4
1981	461.	452.	1144.	1656.	717.	2504.	2056.	3712.	4429.	6933.
1982	467.	459.	1175.	1657.	774.	2504.	2101.	3758.	4532.	7036.
1983	492.	475.	1197.	1743.	911.	2504.	2164.	3907.	4818.	7322.
1984	520.	487.	1216.	1791.	1093.	2504.	2223.	4014.	5107.	7611.
1985	544.	497.	1233.	1817.	1280.	2504.	2274.	4091.	5372.	7876.
1986	566.	501.	1249.	1797.	1474.	2504.	2316.	4113.	5587.	8091.
1987	585.	502.	1263.	1751.	1677.	2504.	2350.	4100.	5777.	8281.
1988	604.	500.	1274.	1677.	1889.	2504.	2378.	4055.	5945.	8449.
1989	627.	506.	1286.	1685.	2035.	2504.	2418.	4103.	6138.	8642.
1990	644.	512.	1298.	1696.	2116.	2504.	2454.	4150.	6266.	8770.
1991	668.	520.	1310.	1710.	2216.	2504.	2498.	4208.	6424.	8928.
1992	699.	529.	1323.	1730.	2340.	2504.	2551.	4281.	6621.	9125.
1993	741.	541.	1338.	1756.	2492.	2504.	2620.	4377.	6869.	9373.
1994	797.	557.	1355.	1792.	2680.	2504.	2709.	4501.	7181.	9685.
1995	872.	577.	1376.	1838.	2910.	2504.	2825.	4663.	7573.	10077.
1996	973.	605.	1402.	1901.	3190.	2504.	2979.	4880.	8070.	10574.
1997	1109.	641.	1434.	1984.	3532.	2504.	3185.	5169.	8701.	11205.
1998	1293.	690.	1476.	2095.	3946.	2504.	3459.	5554.	9500.	12004.
1999	1543.	755.	1530.	2243.	4447.	2504.	3828.	6071.	10518.	13022.
2000	1818.	832.	1601.	2440.	4473.	2504.	4251.	6691.	11165.	13669.

EMX RESIDENT BASIC EMPLOYMENT

EMS1 SUPPORT SECTOR EMPLOYMENT

ENGLV GOVERNMENT EMPLOYMENT

ENCLV ENCLAVE EMPLOYMENT

TONRFISH NONRESIDENT FISHERMEN

EMIL MILITARY EMPLOYMENT

TOEMP1 TOTAL RESIDENT EMPLOYMENT

TOEMP2 TOTAL EMPLOYMENT EXCLUDING NONRESIDENT

FISHERMEN AND MILITARY

TOEMP3 TOTAL EMPLOYMENT EXCLUDING MILITARY

TOEMP4 TOTAL EMPLOYMENT

TABLE 3. BOTTOMFISH EMPLOYMENT BY CATCH AREA

YEAR	CATCH	CATCH JV	CATCH ON	CATCH CP	EMP JV	U.S. Trawlers on-shore	Employment on-shore	Employment Processing	Non-Resident on-shore	Resident on-shore
						EMPON	EMPON	EMPCP	EMPNRV	EMPR
1981	87.3	78.5	0.4	8.4	174.	1.	4.	60.	212.	25.
1982	111.4	100.0	0.5	10.9	222.	1.	5.	74.	269.	31.
1983	174.7	160.0	0.7	14.0	355.	2.	7.	95.	406.	47.
1984	259.1	240.0	1.0	18.1	533.	2.	10.	119.	588.	69.
1985	344.8	320.0	1.4	23.4	710.	3.	14.	149.	775.	91.
1986	432.1	400.0	1.9	30.2	888.	4.	19.	185.	969.	115.
1987	521.7	480.0	2.6	39.1	1066.	6.	26.	232.	1172.	140.
1988	614.1	560.0	3.6	50.5	1243.	8.	36.	289.	1384.	168.
1989	670.1	600.0	4.9	65.2	1332.	11.	49.	360.	1530.	191.
1990	690.9	600.0	6.7	84.2	1332.	15.	68.	447.	1611.	208.
1991	718.0	600.0	9.2	108.8	1332.	20.	93.	555.	1711.	232.
1992	753.2	600.0	12.6	140.6	1332.	28.	127.	688.	1835.	263.
1993	798.9	600.0	17.3	181.6	1332.	38.	175.	851.	1987.	305.
1994	858.4	600.0	23.7	234.7	1332.	53.	239.	1051.	2175.	361.
1995	935.6	600.0	32.4	303.2	1332.	72.	327.	1295.	2405.	436.
1996	1036.1	600.0	44.4	391.7	1332.	99.	448.	1591.	2685.	537.
1997	1166.9	600.0	60.8	506.1	1332.	135.	614.	1950.	3027.	673.
1998	1337.0	600.0	83.2	653.8	1332.	185.	840.	2384.	3441.	857.
1999	1558.6	600.0	113.9	844.7	1332.	253.	1150.	2904.	3942.	1107.
2000	1559.0	311.8	155.9	1091.3	692.	346.	1575.	3525.	3968.	1382.

223

CATCH  
 CATCH JV  
 CATCH ON  
 CATCH CP  
 EMP JV  
 EMPON  
 EMPNRV  
 EMPNRON  
 EMPR

TOTAL U.S. BOTTOMFISH CATCH MT  
 CATCH BY JOINT VENTURE TRAWLERS, MT  
 CATCH FOR ONSHORE PROCESSORS, MT  
 CATCH BY CATCHER PROCESSORS, MT  
 EMPLOYMENT ON JOINT VENTURE TRAWLERS  
 EMPLOYMENT IN ONSHORE PROCESSING PLANTS  
 EMPLOYMENT ON CATCHER PROCESSORS  
 NONRESIDENT WORKERS ON VESSELS  
 NON-RESIDENT ONSHORE EMPLOYMENT  
 RESIDENT ON AND OFFSHORE EMPLOYMENT

end of 06  
 function?

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